4.3 NEVADA TEST SITE

The following sections describe the affected environment at NTS for land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and paleontological resources, and socioeconomics. In addition, radiation and hazardous chemical environment, transportation, and waste management are described.

4.3.1 Land Use and Visual Resources

4.3.1.1 Land Use

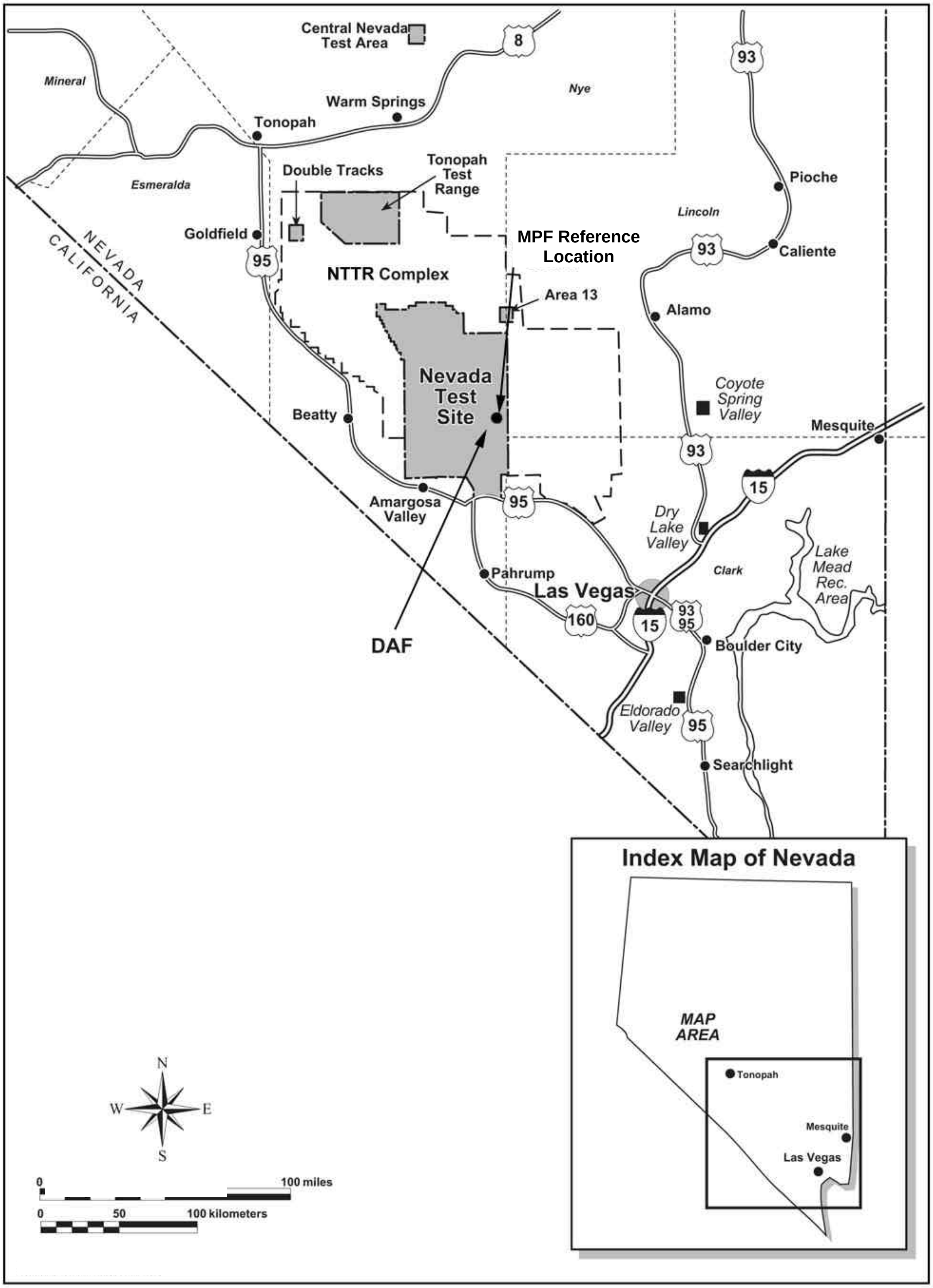
NTS is located on approximately 356,100 ha (879,990 ac) in southern Nye County, Nevada. The site is located 105 km (65 mi) to the northwest of Las Vegas and 16 km (10 mi) northeast of the California state line (see Figure 4.3.1.1–1). All of the land within NTS is owned by the Federal Government and is administered, managed, and controlled by DOE's NNSA.

Federal lands surround NTS, with the Nevada Test and Training Range located on the north, east, and west, and BLM lands on the south and southwest. This area provides a buffer zone varying from 24-105 km (15-65 mi) between the NTS and public lands. Beyond the Federal lands surrounding NTS, principal land uses in Nye County in the vicinity of the site include mining, grazing, agriculture, and recreation. Of the total land area within the county, only a small number of isolated areas are under private ownership and, therefore, are subject to general planning guidelines.

Clark County, Nevada, lies immediately to the east of NTS. The Federal Government owns 95 percent of this county. Primary land uses on these Federal lands include open grazing, mining, and recreation. Rural communities located within the vicinity of NTS include Alamo, 69 km (43 mi) to the northeast; Pahrump, 42 km (26 mi) to the south; Beatty, 26 km (16 mi) to the west; and Amargosa Valley, 5 km (3 mi) to the south.

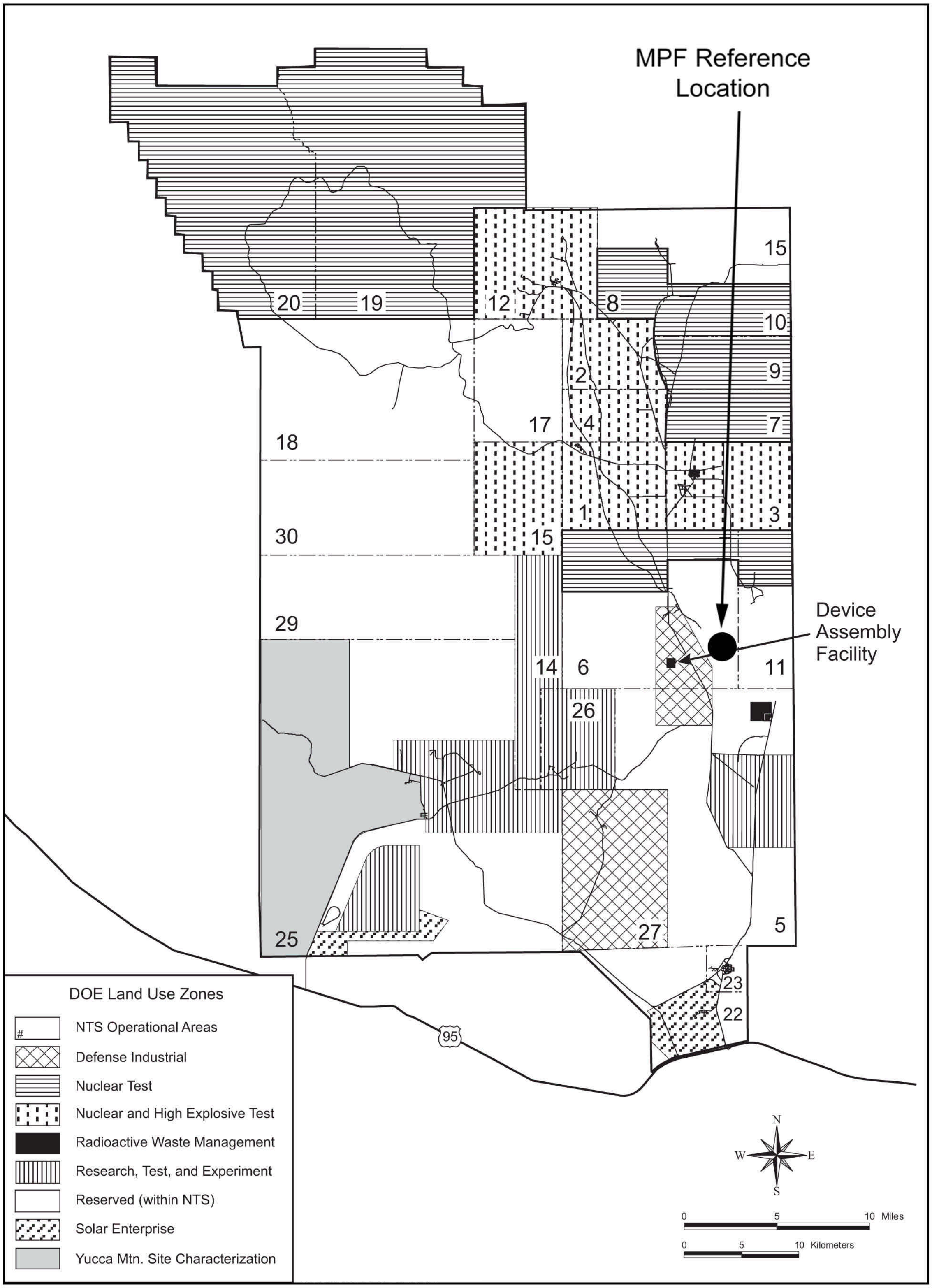
Land use zone categories at NTS include the Nuclear Test Zone, Nuclear and High Explosives Test Zone, Research Test and Experiment Zone, Radioactive Waste Management Zone, Solar Enterprise Zone, Defense Industrial Zone, and Reserved Zone (see Figure 4.3.1.1–2). In most cases, an area is assigned to a land use category based on the environmental characteristics it exhibits. Environmental characteristics, especially geography and geology, generally determine how suitable an area is for a particular use. Technical and experimental areas cluster in those sectors of NTS where geography and geology are most favorable to testing (DOE 1998a) (see Figure 4.3.1.1–3).

Approximately 45 percent of NTS is currently unused or provides buffer zones for ongoing programs or projects, while about 7-10 percent (24,281-35,006 ha [60,000-86,500 ac]) of the site has been disturbed.



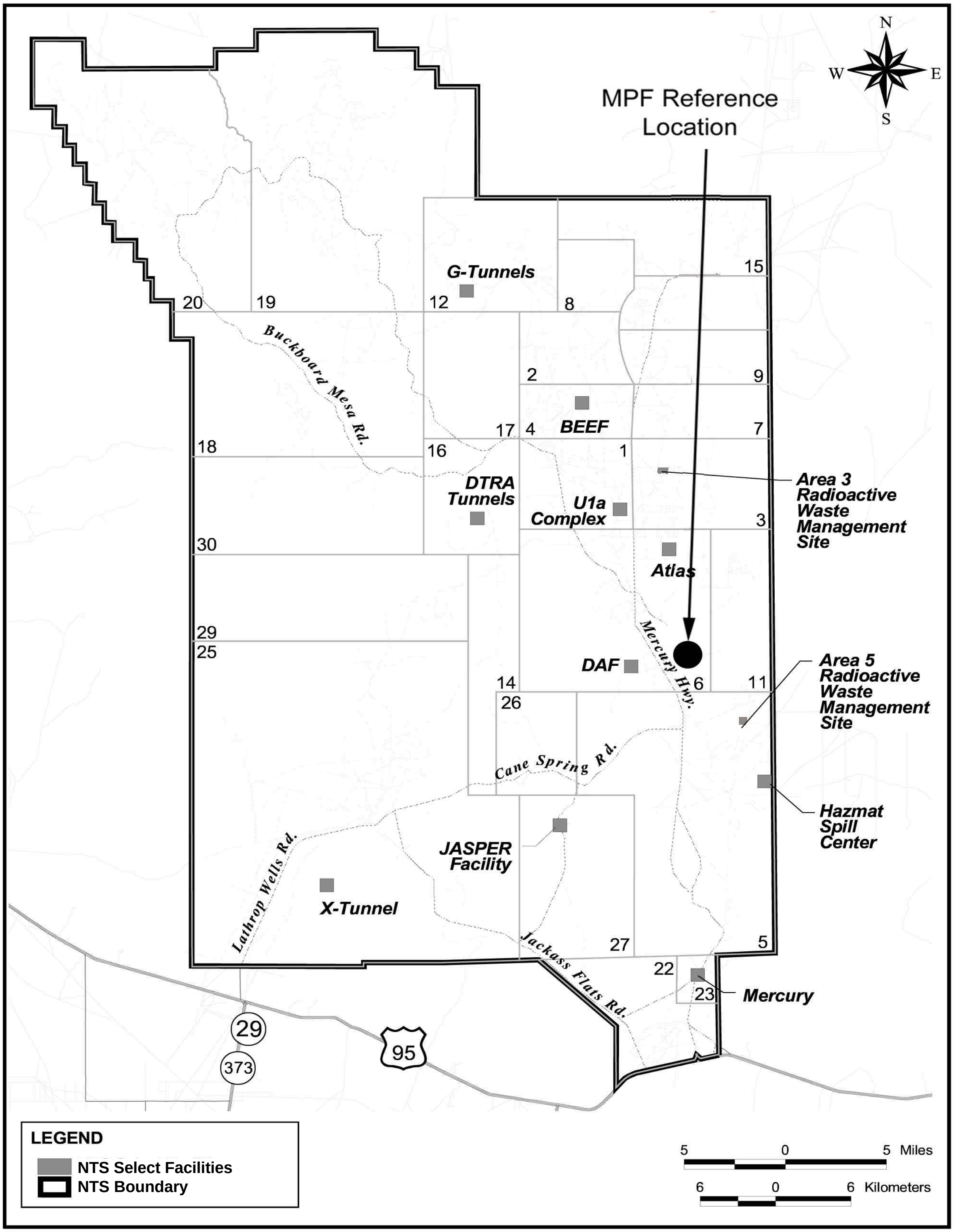
Source: DOE 2002k.

Figure 4.3.1.1–1. Location of the Nevada Test Site



Source: DOE 2002k.

Figure 4.3.1.1–2. Land Use at the Nevada Test Site



Source: DOE 2002k.

Figure 4.3.1.1–3. Technical and Experimental Area Clusters at the Nevada Test Site

The MPF reference location is within Area 6. Area 6 covers approximately 21,200 ha (52,385 ac) between Yucca Flat and Frenchman Flat, straddling Frenchman Mountain. Three land use zones occur in Area 6 (Figure 4.3.1.1–2). The northern quarter of the area is designated as the Nuclear Test Zone, the south central portion is categorized as the Defense Industrial Zone, and the remaining area is designated as the Reserved Zone. More specifically, the MPF reference location lies near the borders between the Defense Industrial and Reserved Zones, just inside of the Defense Industrial Zone boundary. The Defense Industrial Zone is characterized as an area designated for stockpile management of weapons, including production, assembly, disassembly or modification, staging, repair, retrofit, and surveillance. Permanent facilities for stockpile stewardship operations are also included in this zone. The Reserved Zone is characterized by land and facilities that provide widespread flexible support for diverse short-term testing and experimentation. The Reserved Zone is also used for short-duration exercises and training such as nuclear emergency response, Federal Radiological Monitoring and Assessment Center training, and Department of Defense land navigation exercises and training.

NTS is part of the National Environmental Research Park network, although certain areas of the site are excluded from this designation because of operations or other activities related to the primary mission of the site. The National Environmental Research Park designation provides for research into biological diversity, plant and community development in disturbed and undisturbed landscapes, regional climate trends, soil formation differences, and other factors that control environmental conditions. Additionally, the compatibility of the environment with energy technology options can be studied (DOE 1998a).

Land use planning does not occur at the state level in Nevada; however, counties and other municipalities may plan if they choose. The Nye County Comprehensive Plan (NCBC 1994), adopted in 1994, is the most current county-level policy document permitting the county to establish zoning ordinances and land use planning. The Plan is based on five issues pertinent to the county; rapid population growth and/or declines, potential changes in management of public lands, the Yucca Mountain repository project, the withdrawal of public lands from multiple use and other public land planning activities, and the protection of water resources. Pahrump is the only municipality in Nye County to develop a plan. The Pahrump Regional Planning District Master Plan (PRPC 1999), adopted in 1999, was developed in order to address two main issues pertinent to the town, the relatively large growth in Pahrump's population and the protection of the region's water resources.

4.3.1.2 Visual Resources

NTS is located in a transition area between the Mojave Desert and the Great Basin. Vegetation characteristic of both deserts is found on the site. The topography of the site consists of a series of north-south oriented mountain ranges separated by broad, low-lying valleys and flats. Site topography is also characterized by the presence of numerous subsidence craters resulting from past nuclear testing. The southwestern Nevada volcanic field, which includes portions of NTS, is a nested, multi-caldera volcanic field. The facilities of NTS are widely distributed across this desert setting. Within Area 6, the reference location for the MPF, the developed areas are widespread and the undeveloped areas are predominately desert.

The area surrounding NTS ranges from unpopulated to sparsely populated desert and rural land. Access to areas that would have views of the site is controlled by NTS or the U.S. Air Force.

Therefore, few viewpoints are accessible to the general public. Public viewpoints of NTS along U.S. 95, the principal highway between Tonopah and Las Vegas, are limited to Mercury Valley due to the various mountain ranges surrounding the southern boundary of the site. The primary viewpoint in Mercury Valley is a roadside turnoff containing Nevada Historical Marker No. 165 of the Nevada State Park System, entitled “Nevada Test Site.” NTS facilities within 8 km (5 mi) are visible from this viewpoint. The main base camp at Mercury, located in Area 23, is well defined at night by facility lighting. Lands within NTS have a BLM Visual Resource Management rating of Class II or III (See Table 4.2.1.2–1 for definitions of each class.) Management activities within these classes may be seen, but should not dominate the view. Developed areas within the site are consistent with a Visual Resource Management Class IV rating in which management activities dominate the view and are the focus of viewer attention. The same BLM ratings apply to Area 6.

4.3.2 Site Infrastructure

An extensive network of existing infrastructure provides services to NTS activities and facilities as shown in Table 4.3.2–1. These services are discussed in detail in the following sections. Two categories of infrastructure—transportation access and utilities—are described below for NTS. Transportation access includes roads, railroads, and airports while utilities include electricity and fuel (e.g., natural gas, gasoline, and coal).

Table 4.3.2–1. NTS Site-wide Infrastructure Characteristics

Resource	Current Usage	Site Capacity
Transportation		
Roads (km)	1,127[a]	NA
Railroads (km)	0	NA
Electricity		
Energy consumption (MWh/yr)	101,377	176,844
Peak load (MWe)	27	45
Fuel		
Natural gas (m^3/yr)	0	NA
Liquid fuels (L/yr)	4,201,805	Not limited
Coal (t/yr)	0	NA

NA = not applicable.
[a] Includes paved and unpaved roads.
Source: DOE 2002k.

4.3.2.1 Transportation

There are 1,127 km (700 mi) of roads at NTS of which 644 km (400 mi) are paved. There is no railway connection service to NTS (DOE 2002k). NTS has two airstrips and is adjacent to the Nevada Test and Training Range Complex. NTS also benefits from ready access to several additional airports in the area, including McCarran International Airport and the onsite Desert Rock Airport with a runway capable of accepting jet aircraft.

4.3.2.2 Electrical Power

In the last several years, NTS has been provided power under contracts with Nevada Power Company and Western Area Power Administration. Nevada Power Company and Valley Electric Cooperative are dual transmission and station connections available at NTS. Nevada Power Company distributes power to NTS at the Mercury Switching Center in Area 22 by a primary 138-kV supply line. Another 138-kV Nevada Power Company transmission line connects the Mercury Switching Center to the Jackass Flats Substation in Area 25. Valley Electric Cooperative also has a transmission connection to the Jackass Flats Substation. Depending on contractual arrangements, NTS can receive service from either Nevada Power Company or Valley Electric Cooperative. A DOE-owned 138-kV loop extends primary power supply into NTS forward areas where smaller, lower voltage distribution lines feed power to individual facilities.

Table 4.3.2–1 shows that electrical capacity at NTS is approximately 177,000 million MWh/yr and peak load capacity, approximately 45 MWe. In 2000, NTS electrical usage was approximately 101,000 MWh/yr and peak load usage was 27 MWe (DOE 2002k).

4.3.2.3 Fuel

Only unleaded gasoline and diesel fuels are used at NTS. The fuel capacity is 45,424 L (12,000 gal) for unleaded gasoline and 37,853 L (10,000 gal) for diesel fuel. The fuel capacity at the fuel station in Area 6 is 75,706 L (20,000 gal) for both unleaded gasoline and diesel fuel. Bulk storage capacity in Area 6 is 158,983 L (42,000 gal) for unleaded gasoline and 397,457 L (105,000 gal) for diesel fuel (DOE 2002k).

4.3.3 Air Quality and Noise

4.3.3.1 Climate and Meteorology

The climate at NTS is characterized by limited precipitation, low humidity, and large diurnal temperature ranges. The lower elevations are characterized by hot summers and mild winters, which are typical of other Great Basin areas. As elevation increases, precipitation increases and temperatures decrease.

Annual precipitation at higher NTS elevations is about 23 cm (9 in), including snow accumulations. The lower elevations receive approximately 15 cm (6 in) of precipitation annually, with occasional snow accumulations lasting only a few days. Precipitation in the summer falls in isolated showers, which cause large variations among local precipitation amounts. Summer precipitation occurs mainly in July and August, when intense heating of the ground beneath moist air masses triggers thunderstorm development and associated lightning. A tropical storm occasionally will move northeastward from the coast of Mexico, bringing heavy precipitation during September and October.

Elevation influences temperatures at NTS. At an elevation of 2,000 m (6,560 ft) on Pahute Mesa, the average daily maximum and minimum temperatures are 4°C to -2°C (40°F to 28°F) in January and 27°C to 17°C (80°F to 62°F) in July. In the Yucca Flat weapons test basin, at an elevation of 1,195 m (3,920 ft), the average daily maximum and minimum temperatures are 11°C to -6°C (51°F to 21°F) in January, and 36°C to 14°C (96°F to 57°F) in July. Elevation at

Mercury is 1,314 m (4,310 ft), and the extreme temperatures are 21°C to -11°C (69°F to 12 F) in January and 43°C to 15°C (109°F to 59°F) in July. The annual average temperature in the NTS area is 19°C (66°F). Monthly average temperatures range from 7°C (44°F) in January to 32°C (90°F) in July. Relative humidity readings (taken four times per day) range from 11 percent in June to 55 percent in January and December.

Average annual wind speeds and direction vary with location. At higher elevations on Pahute Mesa, the average annual wind speed is 4.5 m/s (10 mph). The prevailing wind direction during winter months is north-northeasterly, and during summer months winds are southerly. In the Yucca Flat weapons test basin, the average annual wind speed is 3 m/s (7 mph). The prevailing wind direction during winter months is north-northwesterly, and during summer months is south-southwesterly. At Mercury, the average annual wind speed is 4 m/s (8 mph) with northwesterly prevailing winds during winter months, and southwesterly prevailing winds during summer months. Wind speeds in excess of 27 m/s (60 mph), with gusts up to 48 m/s (107 mph), may be expected to occur once every 100 years.

Additional severe weather in the region includes occasional thunderstorms, lightning, tornadoes, and sandstorms. Severe thunderstorms may produce high precipitation that continues for approximately 1 hour and may create a potential for flash flooding. Few tornadoes have been observed in the region, and they are not considered a significant event. The estimated probability of a tornado striking a point at NTS is extremely low (3 in 10 million years).

4.3.3.2 Nonradiological Releases

NTS is located in the Nevada Intrastate AQCR. The region is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and particulate matter) under the NAAQS. The nearest non-attainment area is the Las Vegas area, located 105 km (65 mi) southeast of NTS. Las Vegas Valley Hydrographic Area 212, located in Clark County, is serious as moderate non-attainment for carbon monoxide and fugitive dust (PM_{10}). The remaining portion of Clark County is designated as unclassifiable/attainment for these pollutants (40 CFR 81.329).

The nearest Prevention of Significant Deterioration (PSD) Class I areas to NTS are the Grand Canyon National Park, 208 km (130 mi) to the southeast, and the Sequoia National Park, 169 km (105 mi) to the southwest. NTS has no sources subject to PSD requirements.

The criteria air pollutants emitted at NTS include particulates from construction, aggregate production, surface disturbances, and fugitive dust from vehicles traveling on unpaved roads; various pollutants from fuel-burning equipment, incineration, and open burning; and volatile organics from fuel storage facilities. Quantities of emissions from operations are calculated each year and submitted to the State of Nevada. A summary of 2002 emission estimates for sources at NTS is presented in Table 4.3.3.2–1.

Air quality monitoring for the criteria pollutants is not required for NTS. With the exception of the air permit for the Hazardous Materials Spill Center (HSC), the permits issued by the State of Nevada do require opacity and material throughput measurements. The HSC received a waiver by the state from adhering to opacity limits, due to the nature of its operations. Nonradiological monitoring is required by the HSC's air permit, and was conducted for four series of testing conducted at the HSC in 2000.

Table 4.3.3.2–1. NTS Source Emission Inventory in 2002

Source	PM_{10} (kg/hr)	NO_x (kg/hr)	CO (kg/hr)	SO_2 (kg/hr)	VOC (kg/hr)
Area 1 Aggregate Plant	1.63				
Area 1 Batch Plant	5.31				
Area 23 Boiler	0.041	0.41	0.10	0.14	0.01
Area 23 Incinerator	0.035	0.018	0.004	1.8×10^{-6}	9.0×10^{-3}

PM_{10} = particulate matter less than or equal to 10 microns in aerodynamic diameter.
Source: Calman 2003.

The HSC was established in Frenchman Flat in Area 5 as a basic research tool for studying the dynamics of accidental releases of various hazardous materials and the effectiveness of mitigation procedures. In addition to State of Nevada air permit monitoring requirements, offsite monitoring of HSC tests may be required by EPA. Prior to each HSC test series, and, at other tests in the series depending on projected need, the documentation describing the tests are reviewed by EPA to determine whether appropriate air sampling equipment should be deployed downwind of the test at the NTS boundary to measure chemical concentration that may have reached the offsite area. During 2000, no monitoring was required.

Ambient air quality at NTS is not currently monitored for criteria pollutants or hazardous air pollutants, with the exception of radionuclides. Elevated levels of ozone or particulate matter may occasionally occur because of pollutants transported into the area or because of local sources of fugitive particulates. Ambient concentrations of other criteria pollutants (sulfur dioxide, nitrogen oxides, carbon monoxide, and lead) are probably low because there are no large sources of these pollutants nearby. The nearest area with air pollutant sources of concern is Las Vegas. Ambient air quality data for NTS is summarized in Table 4.3.3.2–2. These measurements were recorded from August 15 through September 15, 1990. Monitoring stations were located in Area 23 at Building 525; Area 6 at Building 170; and Area 12 at the sanitation department office trailer.

The existing ambient air concentrations attributed to sources at NTS are expected to represent a small percentage of the ambient air quality standards. No modeled concentrations are available showing the site contributions to ambient concentrations at the site boundary.

Table 4.3.3.2–2. NTS Nonradiological Ambient Air Monitoring Results

Pollutant	Averaging Period	Most Stringent Standard[a] (micrograms per m^3)	Ambient Concentration [b] (micrograms per m^3)		
			Area 6	Area 12	Area 23
Carbon monoxide	8-hour (elevations < 5,000 ft. above msl)	10,000[b]	1,150	2,290	1,370
	8-hour (elevations ≥ 5,000 ft. above msl)	6,870[b]	Not applicable	Not applicable	Not applicable
	1-hour	40,000[c]	1,950	2,750	1,370
Nitrogen dioxide	Annual	100[c]	(d)	(d)	(d)

Table 4.3.3.2–2. NTS Nonradiological Ambient Air Monitoring Results (*continued*)

Pollutant	Averaging Period	Most Stringent Standard[a] (micrograms per m^3)	Ambient Concentration [b] (micrograms per m^3)		
			Area 6	Area 12	Area 23
Sulfur dioxide	Annual	80[c]	(d)	(d)	(d)
	24-hour	365[c]	(d)	15.7	39.3
	3-hour	1,300[c]	(d)	52.4	65.4
PM_{10}	Annual	50[c]	(d)	(d)	(d)
	24-hour	150[c]	20.2	45.4	78.3
Lead	Quarterly	1.5[c]	(d)	(d)	(d)
Ozone	1-hour	235[c]	(d)	(d)	(d)

PM_{10} = particulate matter less than or equal to 10 microns in aerodynamic diameter.
[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic PM_{10} mean standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.
[b] State standard.
[c] Federal standard (NAAQS).
[d] Not measured.
Source: DOE 1996d.

4.3.3.3 Radiological Releases

In 2000, an estimated 431 curies of tritium, 0.32 curies of plutonium-239/240, and 0.049 curies of americium-241 were released to the atmosphere at NTS. These releases were attributed to the diffusion of tritiated (tritium) water vapor from evaporation from tunnel and characterization well containment ponds; diffuse emissions calculated from the results of environmental surveillance activities; and the resuspension of plutonium and americium as measured with air sampling equipment or calculated by use of resuspension equations. The releases and their sources are presented in Table 4.3.3.3–1.

Table 4.3.3.3–1. NTS Radiological Airborne Releases to the Environment in 2000

Radionuclide	Source	Release (Curies)
Tritium (Hydrogen-3)	Area 6, CP-95A Laboratory	4.6×10^{-5}
	Area 6, DAF Laboratory	5.6
	Area 23, Building 650 Laboratory	3.0×10^{-4}
	Area 52, Building A-1, North Las Vegas	0.37
	Onsite	426
Plutonium-239/240	Areas 3 and 9	2.9×10^{-1}
	Other Areas	3.2×10^{-2}
Americium-241	Onsite	4.7×10^{-2}
	Near Offsite, NAFR	2.0×10^{-3}

Source: NTS 2001.

4.3.3.4 Noise

The major noise sources at NTS include equipment and machines (e.g., cooling towers, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materialhandling equipment, and vehicles), blasting and explosives testing, and aircraft operations. No NTS environmental noise survey data are available. At the NTS boundary, away from most facilities, noise from most sources is barely distinguishable above background noise levels.

The acoustic environment in areas adjacent to NTS can be classified as either uninhabited desert or small rural communities. In the uninhabited desert, the major sources of noise are natural physical phenomena such as wind, rain, and wildlife activities, and an occasional airplane. The wind is the predominant noise source. Desert noise levels as a function of wind have been measured at an upper limit of 22 dBA for a still desert and 38 dBA for a windy desert.

A background sound level of 30 dBA is a reasonable estimate. This is consistent with other estimates of sound levels for rural areas. The rural communities day-night average sound level has been estimated in the range of 35-50 dB (EPA 1974). A background sound level of 50 dB is a reasonable estimate for Mercury.

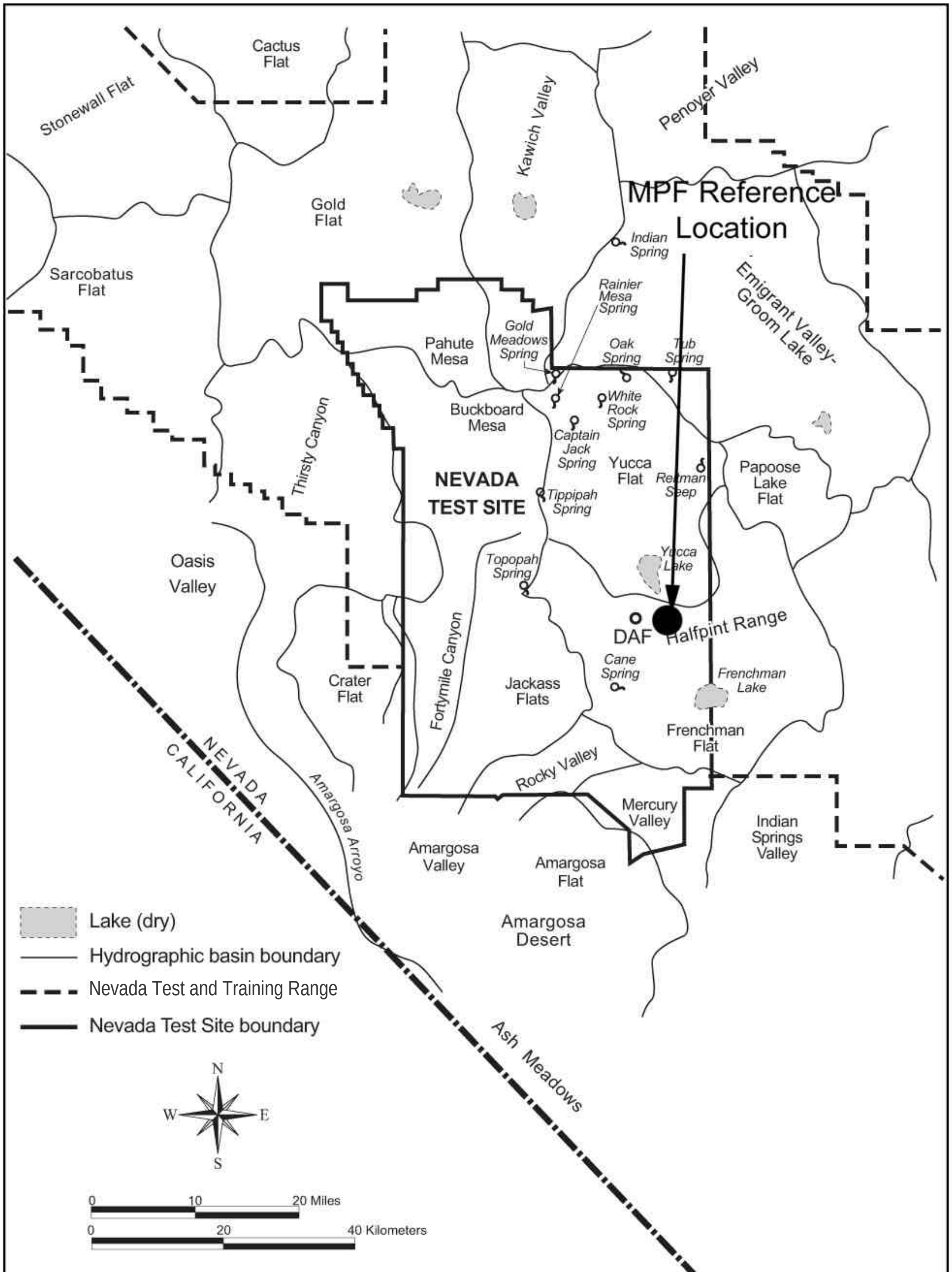
Except for the prohibition of nuisance noise, neither the State of Nevada nor local governments have established specific numerical environmental noise standards.

4.3.4 Water Resources

4.3.4.1 Surface Water

NTS is located within the Great Basin, a closed hydrographic basin from which no surface water leaves except by evaporation. The Great Basin includes much of Nevada. There are no perennial streams or other naturally occurring surface waterbodies at NTS. Streams (arroyos) in the region are ephemeral. Runoff results from snowmelt and from precipitation during storms that occur most commonly during winter and occasionally during fall and spring, as well as during localized thunderstorms that occur primarily in the summer. Much of the runoff quickly infiltrates rock fractures or the surface soils before being lost by evapotranspiration. Some runoff is carried down alluvial fans in arroyos, and some drains onto playas (dry, barren areas in the lowest part of an undrained desert basin that may be marked by an ephemeral lake) where it may stand for weeks as a lake. Runoff in the eastern half of the site ultimately collects in the playas Yucca and Frenchman Lakes of Yucca Flat and Frenchman Flat, respectively (Figure 4.3.4.1–1). In the northeastern portion, runoff drains off the site and onto the Nevada Test and Training Range Complex. In the western half and southernmost part of NTS, runoff is carried toward the Amargosa Desert (DOE 2002k). There are a number of springs on NTS, but seepage from springs travels only a short distance from the source before evaporating or infiltrating into the ground. In addition, there are a number of engineered waste disposal ponds and open reservoirs for industrial water on the site.

Intermittent streams for sheet flow and channelized flow through arroyos cause localized flooding throughout NTS. However, because of the size of NTS, no comprehensive floodplain analysis has been conducted to delineate the 100- and 500-year floodplains. Nevertheless, a rise in the surface elevation of any standing water on a playa creates a potential flood hazard. Playas in the Yucca Flat weapons test basin and Frenchman Flat in the northeastern and eastern part of NTS, respectively, collect and dissipate runoff from their respective hydrographic basins. Several arroyos in the Yucca Flat weapons test basin pose a potential flood hazard to existing



Source DOE 2002k.

Figure 4.3.4.1–1. Nevada Test Site Surface Water Features

facilities, as do arroyos on Frenchman Flat. Ground-surface distance and craters associated with underground nuclear tests have rerouted parts of natural drainage paths in areas of nuclear testing. Some craters have captured nearby drainage, and headward erosion of drainage channels is occurring, however, this is considered to be negligible. In some areas of NTS, the natural drainage system has been all but obliterated by the craters. The western half and southmost parts of NTS have arroyos that carry runoff beyond NTS boundaries during intense storms. Fortymile Wash, the largest of these arroyos and prone to flooding, originates on Pahute Mesa and intersects the Amargosa River in the Amargosa Desert about 32 km (20 mi) southwest of NTS. The Amargosa River continues to Death Valley, California. Tonopah Wash, which runs southwesterly across Jackass Flats from Jackass Divide in the south-central part of NTS, is a major tributary of the Amargosa River (DOE 2002k).

There are no named streams within the Device Assembly Facility (DAF) area and no permanent, natural surface water features near the area. An evaporation/percolation basin is located near the facility. Runoff from the site is conveyed via the natural topography east and southeast toward Frenchman Lake. This playa only retains standing water during the winter months. A stormwater conveyance and diversion structure protects the facility and supporting structures from flooding and is designed for the probable maximum flood (DOE 2002k).

Surface Water Quality

There are no NPDES permits for the site because there are no wastewater discharges to onsite or offsite surface waters. However, the State of Nevada has issued sewage discharge permits for sewage lagoons and ponds for NTS facilities.

4.3.4.2 Groundwater

Groundwater beneath NTS exists within three groundwater subbasins of the Death Valley Basin flow system. This flow system encompasses about 41,000 km^2 (16,000 mi^2) of the Great Basin. In particular, the eastern half of NTS is located within the Ash Meadows Subbasin, and the western half of the site lies largely within the Alkali Flat Furnace Creek Ranch Subbasin. In addition, a small section of the north-west corner of the site is located within the Pahute Mesa Oasis Valley Subbasin (DOE 2002k). Hydrographic areas are mapped on the basis of topographic divides and are the geographic unit used by the State of Nevada for the purposes of water appropriation and management. NTS lies within at least part of 10 of these areas (i.e., Gold Flat, Buckboard Mesa, Kawich Valley, Emigrant Valley, Oasis Valley, Yucca Flat, Jackass Flats, Frenchman Flat, Rock Valley, and Mercury Valley) (DOE 2002k).

While the hydrogeology of the NTS region is complex, three principal hydrogeologic systems are recognized. The first is the valley fill alluvium that mostly consists of gravel, sand, silt, and clay alluvium and playa lake deposits of Quaternary to Late Tertiary age (i.e., recent to about 5 million years old). These deposits comprise the valley fill aquifer. Volcanic rocks including rhyolite lava flow and welded and nonwelded ash flow tuff deposits of mainly Middle to Late Tertiary age (i.e., about 5-24 million years old) characterize the second system. This system encompasses the lava flow and welded-tuff aquifers. The last major system consists of sedimentary rocks ranging in age from Permian/Pennsylvania to Cambrian (i.e., 245-570 million years old) that include the limestones and dolostones comprising the upper and lower carbonate aquifers. Within these systems, six major aquifers and four major aquitards in the region have been defined. Aquifers at NTS not affected by nuclear testing are generally acceptable for drinking water and industrial and agricultural uses. All hydrologic units that supply drinking water to NTS are classified as Class II groundwater (i.e., those that are currently used or are potentially available for drinking water or other beneficial uses) (DOE 2002k). The lower carbonate aquifer primarily represents the regional aquifer and is composed of 4,000-5,000 m (13,120-16,400 ft) of relatively thick, permeable limestones and dolostones with thinner, less permeable siltstones, shales, and quartzites. However, the lower carbonate aquifer is not present in all areas, and rarely is the entire thickness of the unit present under NTS or adjacent areas. Generally, in the eastern half of the site, the water table occurs in the valley-fill alluvium and Tertiary volcanic rocks overlying the regional aquifer and predominantly in the volcanic aquifers across the western half of the site (DOE 2002k). Thinner sequences of these volcanic rocks overlie the upper carbonate aquifer and clastic confining units within some areas of the Yucca and Frenchman Flats (DOE 2002k).

Three principal groundwater subbasins have been identified within the NTS region: the Ash Meadows, Oasis Valley, and Alkali Flat-Furnace Creek Ranch subbasins. The depth to groundwater at NTS varies from about 79 m (260 ft) below land surface in the extreme northwest part of the site, and about 160 m (525 ft) below land surface in portions of Frenchman Flat and Yucca Flat weapons test basin, to more than 610 m (2,000 ft) under the upland portions of Pahute Mesa. Perched groundwater is known to occur in some parts of NTS, mainly in the volcanic rocks of the Pahute Mesa area. Groundwater flows generally south and southwest. The flow system extends from the water table to a depth that may exceed 1,494 m (4,900 ft). The rates of flow are quite variable, with average flow rates over broad areas estimated to range from 2-201 m (7-660 ft) per year.

Recharge for the Death Valley groundwater system is provided by the higher mountain ranges of central and southern Nevada. Groundwater at NTS is also derived from the underflow from basins upgradient of the area (NTS 2001).

Most of the natural discharge from the Death Valley flow system is via transpiration by plants or evaporation from soil and playas in the Amargosa Desert and Death Valley. These discharge locations are dictated by the presence of rocks of lower permeability and lower elevations. Two examples are the Ash Meadows and Alkali Flat discharge areas located south of NTS. The groundwater discharge from the Ash Meadows area is estimated at 21 million m^3 (27 million ft^3) per year. In contrast, groundwater discharge on NTS is more limited and occurs only as a few small springs from perched zones primarily located in the northern, upland areas of the site and from several wells (NTS 2001).

NTS receives its water from a water system divided into four service areas with 11 wells for potable water, 2 wells for nonpotable water, approximately 30 usable storage tanks, 13 usable construction water sumps, and 6 water transmission systems. Potable water is transported to support facilities not connected to the potable water supply system. The annual maximum production capacity of site potable supply wells is approximately 8 billion L/yr (2.1 billion gal/yr). Sustainable site capacity is estimated to be approximately 5.15 billion L/yr (1.36 billion gal/yr) (DOE 2002k).

Groundwater is the only local source of potable water on NTS. Drinking water at NTS is currently provided by the 11 potable wells and is supplemented by bottled water in remote areas. Construction and fire control water are supplied by two nonpotable wells in addition to the potable water supply wells. Springs and seeps are not used for water supply purposes. DOE's water withdrawals have lowered water levels in the vicinity of water supply wells and have resulted in localized changes in groundwater flow direction. In general, the effects of pumping NTS water supply wells are concentrated within a distance of a few thousand feet of the operating wells (NTS 2001).

All water used at DAF in Area 6 is groundwater from 4 (of the 11) potable supply wells (C, C1, 4, and 4a). Wells 4 and 4a withdraw from volcanic aquifers at a depth of about 387 m (1,270 ft), and wells C and C1 withdraw from the carbonate aquifers (upper and lower carbonate aquifers) from depths of 473 and 485 m (1,552 and 1,591 ft), respectively. The depth to groundwater near the margins of Frenchman Flat in the vicinity of DAF is approximately 360 m (1,180 ft) (DOE 2002k). The depth of the water table beneath DAF is approximately 280 m (920 ft) (NTS 2001). The flow is generally to the southwest, but is locally variable.

The State of Nevada strictly controls all surface and groundwater withdrawals. The Appropriation Doctrine governs the acquisition and use of water rights. NTS has been withdrawn from public use and thus possesses an unquantified water right sufficient to meet the purposes of NTS land withdrawal, subject to water rights that existed at the time land for NTS was withdrawn.

Groundwater Quality

The locations of 828 underground nuclear tests have been confirmed at NTS that correspond to areas of potential groundwater contamination. About one-third of these tests were at or below the water table and produced heavy metal contamination and wide range of radionuclide by-products. Detonations conducted near the water table have contaminated groundwater near underground nuclear test cavities with 43 residual radionuclides, with tritium being the most prevalent radionuclide. Radionuclides considered are residual and unburned fissile fuel and tracer material, such as uranium isotopes, plutonium isotopes, americium isotopes and curium-244; fission products such as cesium-137 and strontium-90; tritium, and activities induced by neutrons in device parts, in external hardware, and in the surrounding geologic medium (such as carbon-14, chlorine-16, and calcium-41). Not all of the radionuclides produced during a nuclear test are included in this figure. Many of the nuclides have half-lives so short (microseconds to hours), that they decay to undetectable levels soon after the test. Other nuclides are produced in such low initial abundance that they never exceed levels deemed unsafe or non-permissible by regulatory agencies. Therefore, criteria were developed to exclude such nuclides, thus permitting focus of attention on the nuclides of interest from the perspective of risk assessment (LANL 2001a).

To safeguard the public's health and safety and comply with applicable Federal, state, and local environmental protection regulations as well as DOE directives, groundwater on and near NTS is monitored for radioactivity. Twenty-eight wells and one spring were sampled during the period of May 8 to October 11, 2000. Tritium results from these wells indicated all analyses were well below the national drinking water standard. All of the wells contained gross beta concentrations below the national drinking water standard. Three wells had gross alpha concentrations that exceeded the national drinking water standard. A summary of the three highest monitoring results is listed in Table 4.3.4.2–1.

Table 4.3.4.2–1. Summary of Three Highest NTS Radioactive Constituent Monitoring Results in 2000

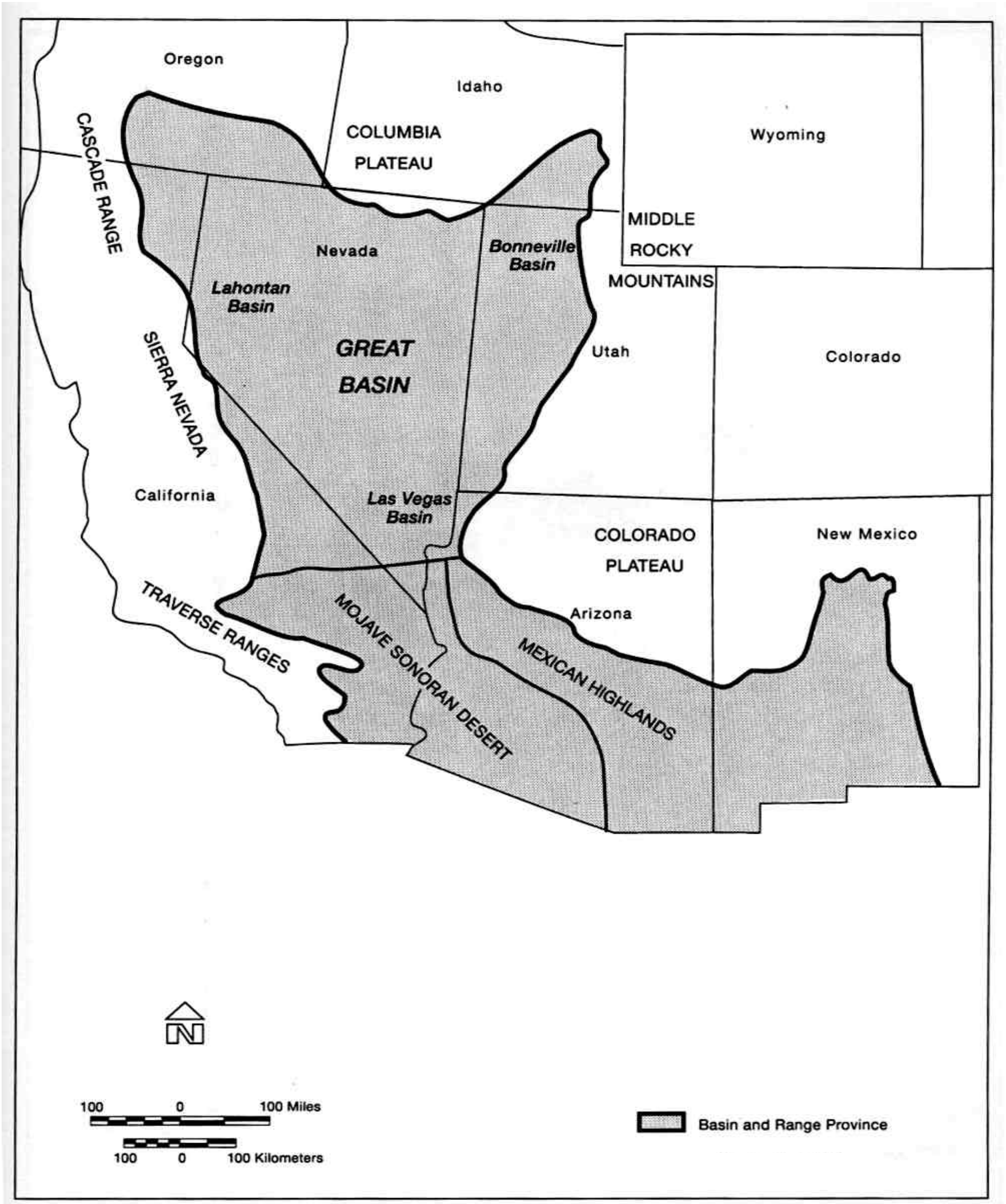
Radioactive Constituent and Area Location	Sample Date	Results (pCi/L)	DCG (pCi/L)
Tritium			
5 RNM #2S	May 17, 2000	195,000	20,000
5 RNM #2S	June 13, 2000	194,000	20,000
5 RNM #2S	June 29, 2000	178,000	20,000
Gross Alpha			
6 Water Well C-1	January 26, 2000	14.20	15
6 Water Well C-1	January 26, 2000	14.50	15
95 ER-OV-02	November 7, 2000	31.00	15
Gross Beta			
Beatty Water and Sewer	December 4, 2000	15.70	4 mrem/yr
95 ER-OV-02	November 7, 2000	17.00	4 mrem/yr
95 TW-5	May 8, 2000	20.00	4 mrem/yr
Radium-226			
UE-16d Eleana Water Well	January 26, 2000	1.45	3
22 Army #1 Water Well	October 24, 2000	2.00	3
95 Roger Bright Ranch	December 5, 2000	1.46	3
Plutonium-238			
95 Crystal Trailer Park	December 6, 2000	0.0467	40
ER-OV-02	November 7, 2000	0.0626	40
95 Tolicha Peak	November 21, 2000	0.0408	40
Plutonium-239 and Plutonium-240			
ER-OV-01	November 6, 2000	0.0160	30
95 Last Trail Ranch	December 5, 2000	0.0125	30
95 Revert Spring	November 7, 2000	0.0151	30
Strontium-90			
5 RNM #5	June 28, 2000	5.80	1,000
95 Fire Hall #2 Well	December 5, 2000	0.593	1,000
95 Last Trail Ranch	December 5, 2000	0.557	1,000

pCi/L = picocuries/Liter.
DCG = DOE Derived Concentration Guidelines.
Source: NTS 2001.

4.3.5 Geology and Soils

4.3.5.1 Geology

NTS is located about 105 km (65 mi) northwest of Las Vegas, Nevada, and lies within the southern part of the Great Basin, the northern-most subprovince of the Basin and Range Physiographic Province (Figure 4.3.5.1–1). NTS is generally characterized by more or less



Source: DOE 1996b.

Figure 4.3.5.1–1. Basin and Range Physiographic Province at NTS

regularly spaced, generally north-south trending mountain ranges separated by alluvial basins that were formed by faulting. There are three primary valleys on NTS: Yucca Flat, Frenchman Flat, and Jackass Flats. The alluvium- and tuff-filled valleys are rimmed mainly by Precambrian and Paleozoic sedimentary rocks and Cenozoic volcanic rocks. The representative site being evaluated for the MPF is in the northern part of Frenchman Flat.

The site features desert and mountainous terrain. The relief of NTS ranges from less than 1,000 m (3,280 ft) above sea level in Frenchman Flat and Jackass Flats to about 2,339 m (7,675 ft) on Rainier Mesa and about 2,199 m (7,216 ft) on Pahute Mesa.

The geology of NTS consists of a thick section (more than 10,597 m [34,768 ft]) of Paleozoic and older sedimentary rocks, locally intrusive Cretaceous granitic rocks, a variable assemblage of Miocene volcanic rocks, and locally thick deposits of postvolcanic sands and gravels that fill the present day valleys (NTS 2001).

Geologic Conditions

This subsection describes the geologic conditions that could affect the stability of the ground and infrastructure at NTS and includes potential volcanic activity, seismic activity (earthquakes), slope stability, surface subsidence, and soil liquefaction.

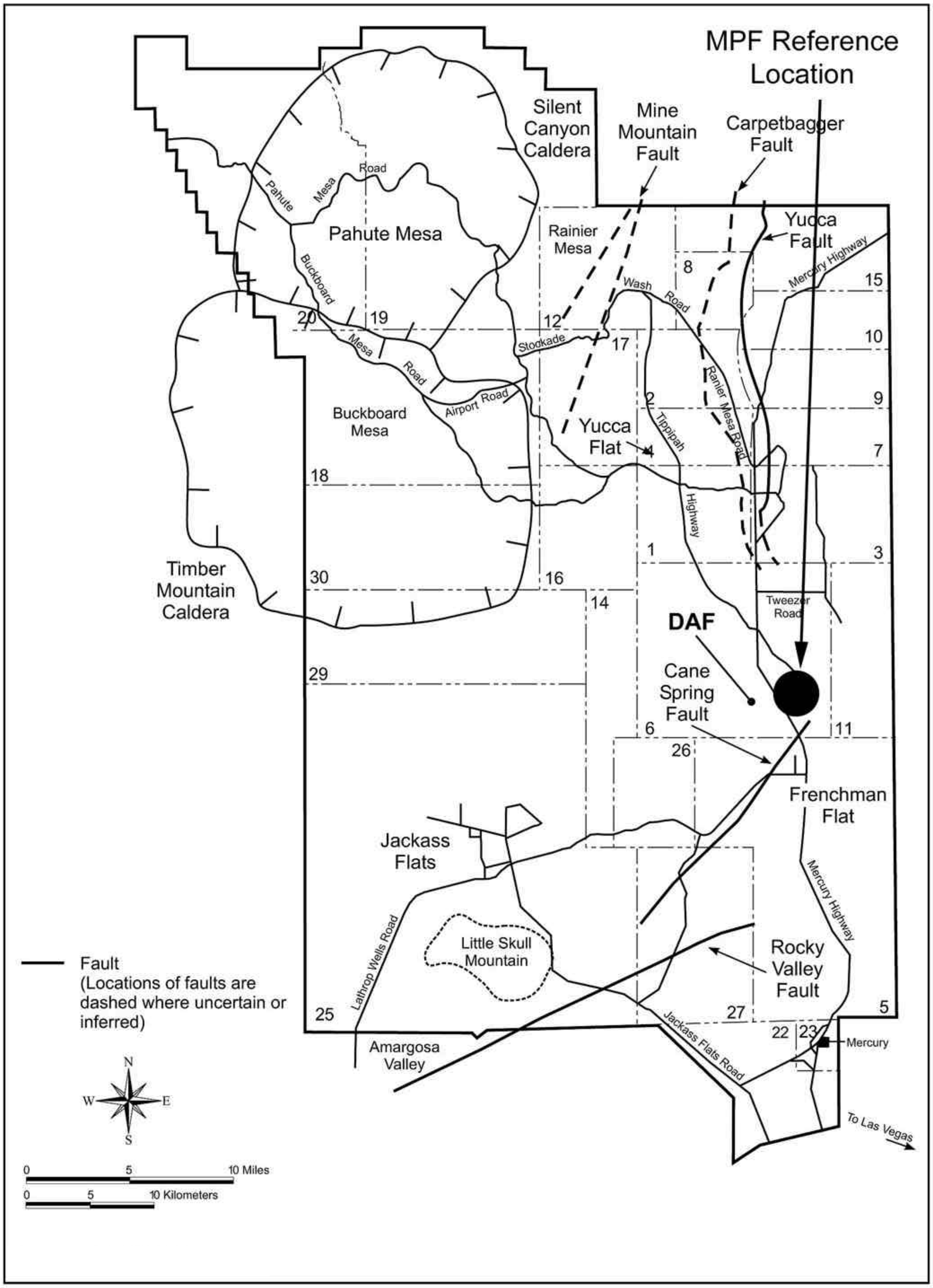
Volcanism

Eruptions of the southwest Nevada volcanic field occurred in the Middle Tertiary Period (NTS 2001). Several late Cenozoic, silicic caldera complexes occur in an eastward-trending belt. The Stonewall Caldera is the youngest (7.5×10^6 years) major silicic center in the area. Silicic volcanism is characterized by large-volume explosive eruptions.

A transition from predominantly silicic volcanism to predominantly basaltic volcanism, characterized by low-volume mild eruptions, was initiated approximately 1.0×10^8 years ago (NTS 2001). Since 7.5×10^6 years ago, only scattered, short-duration volcanic activity occurred in Nevada. The nearest examples of Quaternary volcanic cones and lava flows are located in Crater Flat, west of NTS (NTS 2001). Based on analysis of previous basaltic volcanism in the NTS region, there is no evidence of either an increase in the volcanic rate or the development of a large-volume volcanic field (NTS 2001).

Seismic Activity

The most prominent structures are related to basin-and-range extensional faulting that is younger than the volcanic rocks. In Frenchman Flat, structure strikes are mostly west-southwest. Three major fault zones in the region may be currently active: Mine Mountain, Cane Spring, and Rock Valley (Figure 4.3.5.1–2). Small earthquakes recently occurred at or near the Cane Spring Fault zone and the Rock Valley Fault zone, although no surface displacement was associated with either of these earthquakes (NTS 2001). A fault near Little Skull Mountain in the southwest part of NTS was the site of an earthquake with an approximate Richter magnitude of 5.6 in 1992 (see Table 4.2.5.1–2). This is the largest earthquake recorded within the boundaries of NTS and may have been associated with the approximate Richter magnitude 7.5 earthquake near Landers, California, which occurred less than 24 hours earlier. Although there was no surface rupture, the



Source: DOE 2002k.

Figure 4.3.5.1–2. Major Faults at NTS

Little Skull Mountain earthquake was the first to cause significant damage to facilities on NTS. These facilities, however, were built prior to the more stringent building codes presently followed on NTS (NTS 2001).

Additionally, the Yucca Fault in the Yucca Flat weapons test basin has been active in the recent geologic past (NTS 2001). This fault displaces surface alluvium by as much as 18 m (60 ft). Displacement of this young surface alluvium indicates that movement on Yucca Fault has occurred within the last few thousand to tens of thousands of years; subsurface displacement along this fault is 213 m (700 ft). The Carpetbagger Fault lies west of the Yucca Fault within the Yucca Flat weapons test basin (Figure 4.3.5.1–2). In the subsurface, this fault shows about 610 m (2,000 ft) of displacement in the past 7.5×10^6 years (NTS 2001).

Naturally occurring seismic events are associated with extensional tectonic activity characteristic of the province (NTS 2001). Human-induced historic seismic events recorded since 1868 include those resulting from (1) filling Lake Mead, (2) high-explosive tests, (3) underground nuclear-explosive tests, (4) postnuclear explosion cavity collapses, or (5) after shocks from nuclear explosions (NTS 2001). Parts of both the Yucca Fault and the Carpetbagger Fault have been reactivated from nearby testing of nuclear devices (NTS 2001).

Slope Stability, Subsidence, and Soil Liquefaction

Within the region, no natural factors have been reported as affecting engineering aspects of slope stability. External factors that have or could affect slope stability in the region include load and fracturing and ground motion associated with nuclear explosions. Although not reported as problematic, caution is warranted for certain activities (e.g., construction and drilling) on or near slopes in or near areas of previous nuclear testing. On NTS, particular caution is warranted on or near slopes that have been tunneled for nuclear testing.

Although not reported as problematic in the region, soils in arid environments can be conducive to swelling or contraction as water is added or removed. Site-specific evaluation for expandable clay would be necessary for specific activities because soils in the region have not been mapped extensively.

Certain areas where nuclear devices have been tested may be less stable than other areas. Such areas are not appropriate for other types of use because of their instability; these areas are fenced and controlled.

4.3.5.2 Soils

In general, the soils of NTS are similar to those of surrounding areas and include aridisols and entisols. The degree of soils development reflects their age, and the soils types and textures reflect their origin. Entisols generally form on steep mountain slopes where erosion is active. The aridisols are older and form on more stable fans and terraces.

The soils of the southern NTS reflect the mixed alluvial sediments upon which they form (NTS 2001). These soils are generally young in profile development and show only weak evidence of leaching. In general, soils texture is gradational from coarse-grained soils near the mountain fronts to fine-grained soils in the playa areas of the Yucca Flat weapons test basin and Frenchman Flat. Most soils are underlain by a hardpan of caliche. Soil salinity generally increases dramatically in the direction of the playa areas, with the highest level of soluble salts having accumulated in the deeper soil profile horizons in Frenchman Flat. None of the series in southwestern Nye County identified, including the region south and west of NTS, are considered prime farmland (EBS 1999).

Soil Erosion

Soil loss through wind and water erosion is a common occurrence throughout NTS and surrounding areas. Portions of some watersheds probably exhibit higher erosion rates, but the erosion conditions and susceptibility of soils on NTS have not been defined.

Mineral Resources

Important mineral commodities in the NTS region include gold, silver, copper, lead, zinc, tungsten, and uranium (NTS 2001). NTS has been closed to commercial mineral development since the 1940s (NTS 2001). Reactivation of many other gold districts in the region, in response to current gold prices and modern extraction technologies, suggests that the potential for precious metal deposits in the NTS region should be considered moderate to high (NTS 2001).

No occurrences of oil and gas, coal, tar sand, or oil shale in the region have been reported. Hot springs are common in the province (NTS 2001). However, if water temperatures near Yucca Mountain are representative (50-60°C [120-140°F]), water temperatures in the region may be insufficient for commercial power development.

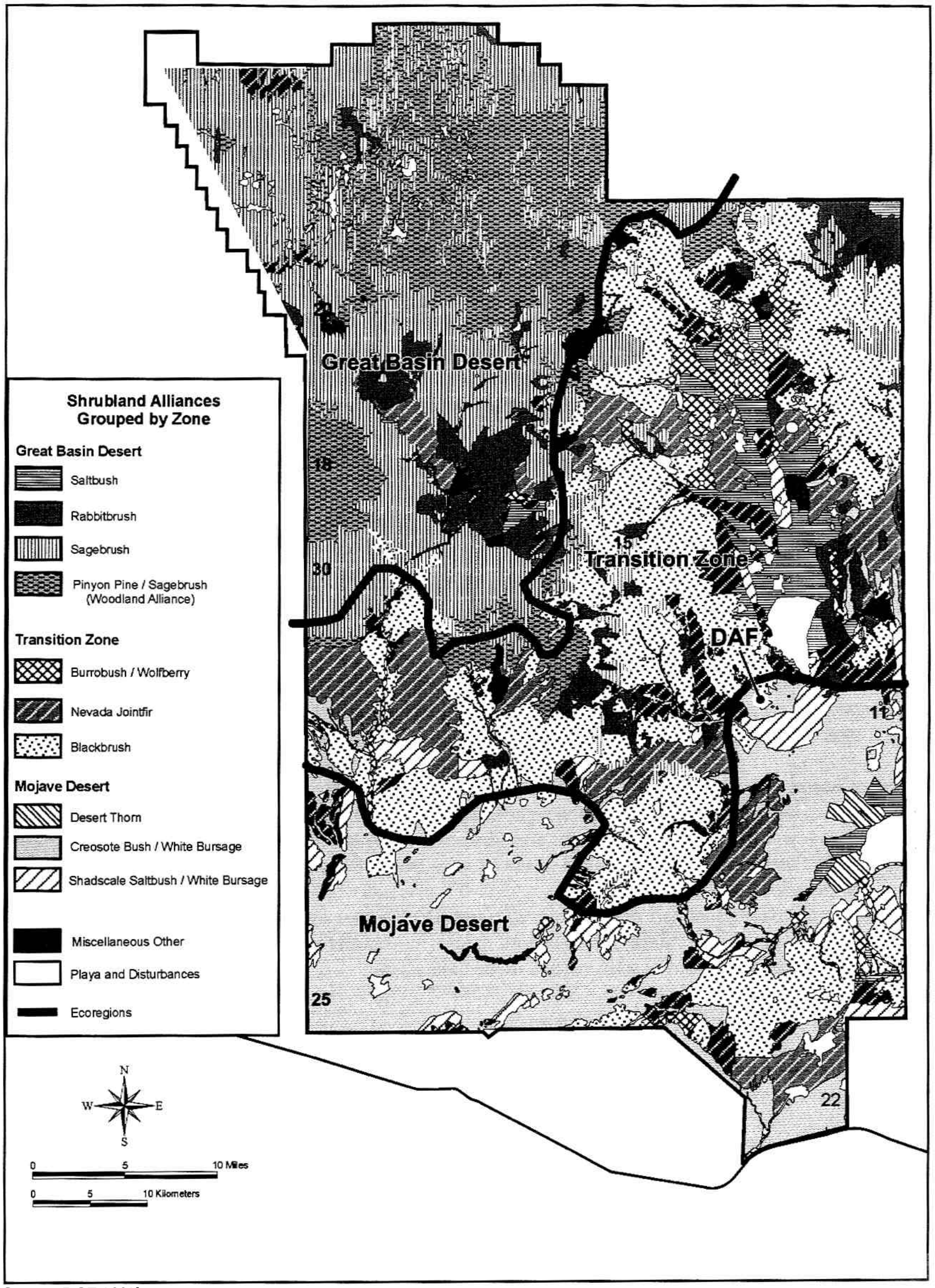
Most of the alluvial valleys in the region have aggregate resources at least along the flanks of adjacent mountains. The quantity and quality of these resources are likely sufficient to meet future demand. These resources do not have any unique value over aggregate occurring in other areas throughout southern Nevada.

4.3.6 Biological Resources

4.3.6.1 Terrestrial Resources

NTS is located along the transition zone between the Mojave Desert and Great Basin Desert. As a result, it has a diverse and complex mosaic of plant and animal communities representative of both deserts, as well as some communities common only in the transition zone between these deserts (Figure 4.3.6.1–1). This transition zone extends to the east and west far beyond the boundaries of NTS. Thus, the range of almost all species found onsite also extends beyond the site, and there are few rare or endemic species present.

Mojave Desert plant communities are found at elevations below approximately 1,219 m (4,000 ft) in Jackass Flats, Rock and Mercury Valleys, and Frenchman Flat. Creosote bush (*Larrea tridentata*) is the visually dominant shrub and is associated with a variety of other shrubs, including white bursage (*Ambrosia dumosa*) at the proposed project site, depending on soil type and elevation. Two plant communities are unique to the transition zone. The first, which occurs at elevations from 1,219-1,524 m (4,000-5,000 ft), is dominated by blackbrush (*Coleogyne ramosissima*). The second occurs in the bottom of enclosed Frenchman and Yucca Flat weapons test basins, where trapped winter air is too cold for typical Mojave Desert plants. The most abundant shrubs in these areas include three species of wolfberry (*Lycium* spp.) Little



Source: DOE 2002k.

Figure 4.3.6.1–1. Vegetation Association at Nevada Test Site

or no vegetation grows on the playas in these basins. Plant communities typical of the Great Basin Desert occur at elevations generally above 1,524 m (5,000 ft). Communities dominated by saltbush (*Atriplex* spp.), rabbitbrush (*Chrysothamnus* spp.), sagebrush (*Artemisia* spp.), and pinion pine (*Pinus pinea*)/sagebrush occur with increasing elevation. Over 700 plant taxa have been found at NTS.

Two hundred seventy-nine species of terrestrial vertebrates have been recorded at NTS, including 54 species of mammals, 190 species of birds, and 33 species of reptiles. Typical Mojave Desert species found at the site include kit fox (*Vulpes velox*), Merriam's kangaroo rat (*Dipodomys merriami*), desert tortoise (*Gopherus agassizii*), chuckwalla (*Sauromalus obesus*), western shovelnose snake (*Chionactis occipitalis)*, and sidewinder snake (*Crotalus cerastes)*. Typical Great Basin Desert species include cliff chipmunk (*Eutamias dorsalis)*, Great Basin pocket mouse (*Perognathus parvus*), mule deer (*Odocoileus hemionus*), northern flicker (*Colaptes auratus*), scrub jay (*Aphelocoma coerulescens)*, Brewer's sparrow (*Spizella breweri)*, western fence lizard (*Sceloporus occidentalis)*, and striped whipsnake (*Masticophis taeniatus)*. About 60 wild horses (*Equus caballus*) live on the northern part of NTS. Water holes, both natural and manmade, are important to many species of wildlife, including game animals such as pronghorn (*Antilocapra americana*) and mule deer. Hunting is not permitted anywhere on NTS.

Raptors such as the turkey vulture (*Cathartes aura*) and rough-legged hawk (*Buteo lagopus*), and carnivores such as the long-tailed weasel (*Mustela frenata*) and bobcat (*Lynx rufus*) are two ecologically important groups on the site. A variety of migratory birds have been found at NTS (DOE 2002k).

Vegetative communities that are found within Area 6 include those of both the Mojave Desert and transition zone. The DAF is located within habitat most like that of the Mojave Desert. Gentle slopes cut by shallow arroyos 1-3 m (3-10 ft) deep with shallow soils characterize the area. Facilities associated within the DAF include a paved access road, a water storage tank, a diversion ditch uphill of the buildings, and sewage evaporation ponds. Whereas cleared areas have removed habitat for most animals of the site, the sewage evaporation ponds have provided unlimited water to birds of the region. Baseline biological studies associated with the DAF facility, conducted in 1993 and 1994, identified 117 species of plants, 11 mammals, 71 birds, and 16 reptiles in the vicinity of the DAF (DOE 2002k). Dominant plants were the Joshua tree (*Yucca brevifolia*) and creosote bush. Common animals included the Merriam's kangaroo rat, long-tailed pocket mouse (*Chaetodipus formosus)*, mourning dove (*Zenaida macroura*), house finch (*Carpodacus mexicanus*), black-throated sparrow (*Amphispiza bilineata*), zebra-tailed lizard (*Callisaurus draconoides*), and side-blotched lizard (*Uta stansburiana*).

4.3.6.2 Wetlands

There are 24 springs and seeps found at NTS, most of which support wetland vegetation such as cattail (*Typha latifolia*), sedges (*Carex* spp.), and rushes (*Juncus* spp.). It is likely that these would constitute wetlands as defined under Section 404 of the *Clean Water Act* (CWA). One newly identified wetland, a historic borrow pit that catches water in large enough quantities and for long enough periods of time to sustain wetland vegetation, has been identified (DOE 2002k).

There is one natural waterbody, Yucca Lake, found within Area 6. It is located about 6.5 km (4 m) north of DAF. However, the reference location for the MPF is in the Frenchman Lake drainage area, which is located in Area 5. There are no wetlands located within the vicinity of DAF.

4.3.6.3 Aquatic Resources

Known natural water sources on NTS consist of 24 springs and seeps, 4 tanks (natural rock depressions that catch and hold surface runoff), and 1 intermittent playa pond. Man-made impoundments on NTS, that are scattered throughout the eastern half of the site, support three introduced species of fish: bluegill (*Lepomis macrochirus*), goldfish (*Carassius auratus*), and golden shiners (*Notemigonus crysoleucas*). Eighty-one species of plants and 138 species of animals (not all of which are aquatic species) have been documented at or near aquatic sites on NTS (DOE 2002k).

The surface hydrologic connection is between the reference site and Frenchman Lake in Area 5. There is one natural waterbody, Yucca Lake, located in Area 6 (see Figure 4.3.4.1–1) and several sewage evaporation ponds located at the DAF site. As noted above, these ponds are important to birds of the region.

4.3.6.4 Threatened and Endangered Species

The only federally-threatened species found at NTS is the Mojave Desert population of the desert tortoise (Table 4.3.6.4–1). Desert tortoises are found throughout the southern half of the site. The abundance of tortoises at NTS is low to very low compared to other areas within the range of this species. NTS contains less than 1 percent of the total desert tortoise habitat of the Mojave Desert population (DOE 2002k).

Area 6 is located within that part of the Mojave Desert that makes up the northern-most territory for the desert tortoise. No other threatened or endangered species have been found in the area around the DAF. In addition, no critical habitat has been identified in the area.

4.3.7 Cultural and Paleontological Resources

4.3.7.1 Cultural Resources

All undertakings at NTS are conducted in compliance with relevant cultural resource Federal legislation, particularly Sections 110 and 106 of the NHPA, and DOE orders and policies that address cultural resource protection and management. DOE entered into a Programmatic Agreement in 1990 with the Nevada SHPO and the Advisory Council on Historic Preservation. In addition, cultural resource compliance at NTS follows the policies presented in the *Cultural Resources Management Plan for the Nevada Test Site* (DOE 1999d). The ROI for cultural resources is the entire NTS site.

There have been 443 cultural resource investigations at NTS, covering approximately 5.5 percent of the land (DOE 2002i). Most of these investigations have been 100-percent-coverage pedestrian surveys, with some data recovery excavation and Native American ethnographic consultation. A total of 2,960 cultural resources has been recorded. National Register eligibility for these resources is as follows: 1,512 resources are not eligible, 1,075 resources are eligible or

Table 4.3.6.4–1. Listed Threatened and Endangered Species, Species of Concern, and Other Unique Species that Occur or May Occur at NTS

Species	Federal Classification	State Classification	Occurrence at NTS
Mammals			
Fringed-myotis *Myotis thysanodes*	Special Concern	Unlisted	Occasional
Long-eared myotis *Myotis evotis*	Special Concern	Unlisted	Occasional
Long-legged myotis *Myotis volans*	Special Concern	Unlisted	Occasional
Pale Townsend's big-eared bat *Plecotus townsendii pallescens*	Special Concern	Unlisted	Occasional
Pygmy rabbit *Brachylagus idohoensis*	Special Concern	Unlisted	Potential habitat
Small-footed myotis *Myotis ciliolabrum*	Special Concern	Special Concern	Potential habitat
Spotted bat *Euderma maculatum*	Special Concern	Protected by State of Nevada	Occasional
Birds			
American peregrine falcon *Falco peregrinus aratum*	Special Concern	Unlisted	Occasional
Black tern *Chilidonias niger*	Special Concern	Special Concern	Potential habitat
Ferruginous hawk *Buteo regalis*	Special Concern	Unlisted	Rare Transient
Gray flycatcher *Empidonax wrightii*	Special Concern	Unlisted	Potential habitat
Least bittern *Ixobrychus exilis hesperis*	Special Concern	Special Concern	Potential habitat
Lucy's warbler *Vermivora lucine*	Special Concern	Unlisted	Potential habitat
Phainopepla *Phainopepla nitens*	Special Concern	Special Concern	Potential habitat
Western burrowing owl *Athene cunicularia hypugea*	Special Concern	Protected by State of Nevada	Resident
White-faced ibis *Plegadis chihi*	Special Concern	Protected by State of Nevada	Migrant
Reptiles			
Bandelier Gila monster *Heloderma suspectum cinctum*	Special Concern	Special Concern	Potential habitat
Chuckwalla *Sauromalus obesus*	Special Concern	Unlisted	Resident
Desert tortoise *Gopherus agassizii*	Threatened	Protected by State of Nevada	Resident
Plants			
Beatley milk vetch *Astragalus beatleyae*	Special Concern	Endangered	Potential habitat
Beatley phacelia *Phacelia beatleyae*	Special Concern	Unlisted	Potential habitat
Black woolypod *Astragalus funereus*	Special Concern	Unlisted	Potential habitat
Cane Spring evening primrose *Camissonia megalanatha*	Special Concern	Unlisted	Potential habitat

Table 4.3.6.4–1. Listed Threatened and Endangered Species, Species of Concern, and Other Unique Species that Occur or May Occur at NTS *(continued)*

Species	Federal Classification	State Classification	Occurrence at NTS
Plants *(continued)*			
Clokey's egg-vetch *Astragalus oopherus var. clokeyanus*	Special Concern	Unlisted	Potential habitat
Death Valley beard tongue *Penstemon fruticiformis var. amargosae*	Special Concern	Unlisted	Potential habitat
Delicate rock daisy *Perityle megaloceplala var. intricata*	Special Concern	Special Concern	Potential habitat
Eastwood milkweed *Aschepias eastwoodiana*	Special Concern	Special Concern	Potential habitat
Kingston bedstraw *Galium hilendiae ssp. Kingstonense*	Special Concern	Unlisted	Potential habitat
Pahute Mesa beardtongue *Penstemon pahutensis*	Special Concern	Unlisted	Potential habitat
Pahute Mesa green gentian *Frasera pahutensis*	Special Concern	Unlisted	Potential habitat
Parish's phacelia *Phacelia parishii*	Special Concern	Unlisted	Potential habitat
Sanicle biscuitroot *Cymopterus ripleyi var. saniculoides*	Special Concern	Unlisted	Potential habitat
White bearpoppy *Arctomecon merriami*	Special Concern	Unlisted	Potential habitat
White-margined beardtongue *Penstemon albomarginatus*	Special Concern	Unlisted	Potential habitat

Source: DOE 2002k.

potentially eligible, and 373 resources are undetermined. Ninety-six percent of the resources are prehistoric, with the remainder either historic, recent significant, multicomponent, or unknown (DOE 2002i).

Prehistoric Resources

Prehistoric sites found on NTS include habitation sites with wood and brush structures, wind breaks, rock rings, rock shelters, rock art, hunting blinds, rock alignments, quarries, temporary camps, milling stations, roasting pits, water caches, and limited activity locations (DOE 2002k).

Areas of NTS that appear to have the highest prehistoric site density are the northwest part, on and around Pahute and Rainier Mesas, and in the southwest part, on and around Jackass Flats, Yucca Mountain, and Shoshone Mountain. However, the distribution information is preliminary. The high number of cultural resources in these areas is somewhat related to the numerous NTS activities that have taken place there, as most cultural resource investigations are conducted in response to planned NTS activities (DOE 2002i).

Historic Resources

Historic sites found include mines and prospects, trash dumps, settlements, campsites, ranches and homesteads, developed springs, roads, trails, and nuclear weapon development sites. At least 600 buildings, structures, and objects dating to the Cold War era have been identified at NTS, but these have not been systematically recorded or evaluated for significance. Frenchman Flat and Yucca Flat are rich in significant resources pertaining to the Cold War era (DOE 2002k).

Native American Resources

DOE has an extensive record of consultation with interested tribes concerning new, existing, and proposed activities at NTS. The Nevada Site Office has been consulting with Native Americans since 1988. These consultations have led to the establishment of the Consolidated Group of Tribes and Organizations (CGTO), which includes members from 16 tribes and 2 pan-tribal organizations, representing 3 ethnic groups which were found to have prehistoric and historic ties to NTS: Western Shoshone, Southern Paiute, and Owens Valley Paiute. Consultations with the CGTO and other affiliated tribes are ongoing and follow the policies set forth by DOE and the current executive orders (DOE 2002i).

The CGTO has identified several sites at NTS that are important to Native American people, including storied rocks, rock shelters, wooden lodges, rock rings, springs, and certain archaeological sites. In addition, 107 plant and more than 20 animal species resident on NTS have been identified by Native American elders as part of their traditional resources (DOE 2002k).

Cultural Resources on the Reference Location

The reference location for the MPF at NTS is located in the southern portion of Area 6, which is located within the Frenchman Flat basin and east of the DAF. As of 2000, approximately 2,426 ha (5,995 ac) of the basin had been inventoried for cultural resources, with one survey in Area 6 encompassing 1,089 ha (2,690 ac) surrounding the DAF. A total of 101 prehistoric sites has been recorded in the basin, and the survey in Area 6 located only 6 prehistoric sites (DOE 2002k; DOE 2000a). Four historic resources have been identified in the Frenchman Flat basin; two are unspecified and two are related to nuclear testing and research. The above-mentioned survey in Area 6 did not identify any historic resources. However, Frenchman Flat has been noted as an area rich in Cold War-era resources (DOE 2002k). The CGTO has stated that Frenchman Flat contains a wide variety of plants, animals, and archaeological sites of cultural importance to Native American people. A total of 20 plant species was identified at 2 plant study locations within the west-central portion of the basin (DOE 2002k).

4.3.7.2 Paleontological Resources

Alluvium-filled valleys surrounded by ranges composed of Precambrian and Paleozoic sedimentary rocks and Tertiary volcanic tuffs and lavas characterize the surface geology of NTS. Although the Precambrian deposits contain only a few poorly preserved fossils, the Paleozoic marine limestones are moderately to abundantly fossiliferous, and can contain trilobites, conodonts, ostracods, corals, brachiopods, cephalopods, algae, gastropods, and archaic fish. These fossils are relatively common and have low research potential. The Tertiary volcanic deposits were not conducive to preservation when deposited and thus are not expected to contain fossils.

Late Pleistocene terrestrial vertebrate fossils could be expected in the Quaternary alluvial deposits. Discovery of mammoth, horse, camel, and bison remains could be expected since these types of remains have been found near NTS. Although no known fossil localities have been recorded on NTS, Quaternary deposits with paleontological materials may occur onsite (DOE 2002k, DOE 1996c).

4.3.8 Socioeconomics

Socioeconomic characteristics addressed at NTS include employment, income, population, housing, and community services. These characteristics are analyzed for a two-county ROI, Clark and Nye Counties in Nevada, where 97 percent of site employees reside, as shown in Table 4.3.8–1 (DOE 2002k).

Table 4.3.8–1. Two-County ROI Where NTS Employees Reside

County	Percent of Site Employment
Clark County	90
Nye County	7

Source: DOE 2002k.

4.3.8.1 Employment and Income

The service sector employs the greatest number of workers in the ROI, providing more than 44 percent of employment in the ROI. Other important sectors of employment include retail trade (16.4 percent); finance, insurance, and real estate (9.4 percent); and government (9.2 percent) (BEA 2002).

The labor force in the ROI increased 74.2 percent between 1990 and 2001, an average of 6.7 percent each year. This increase was over 20 percent greater than the labor force increase for the State of Nevada, which only increased a total of 53.9 percent over the same time period. Total employment in the ROI increased at a slightly slower pace than the labor force. ROI unemployment increased from 4.7 percent in 1990 to 5.5 percent in 2001. The state-wide average unemployment increased from 4.9 in 1990 to 5.3 in 2001 (BLS 2002a).

Per capita income in the ROI ranged from a high of $28,690 in Clark County to a low of $23,479 in Nye County in 2000. The average per capita income in the ROI was $28,570, compared to the State of Nevada average of $29,506 (BEA 2002).

4.3.8.2 Population and Housing

Between 1990 and 2000, the ROI population grew from 759,149 to 1,408,250, an increase of 85 percent. This increase was greater than for the State of Nevada, which grew at a rate of 66.3 percent during the same time period. Clark County had the highest rate of growth at 85.6 percent, while Nye County had the lowest rate of growth at 82.7 percent (Census 2002).

The number of housing units in the ROI was 575,733 in 2000, with 525,562 units occupied. Of these occupied units, 313,001 were owner-occupied and 212,561 were occupied rental units. In

2000, the homeowner vacancy rate in the ROI ranged from 2.6 percent in Clark County to 3.4 percent in Nye County, while the rental vacancy rate ranged from 9.7 percent in Clark County to 17.9 percent in Nye County. This is comparable to the State of Nevada rates of 2.6 percent homeowner vacancy and 9.7 percent rental vacancy. The greatest number of housing units in the ROI is in Clark County with more than 97 percent of the total housing units.

4.3.8.3 Community Services

There are two school districts in the ROI serving 236,945 students. The student-to-teacher ratio in these districts ranges from 15.5 in Nye County to 19.7 in Clark County. The average student to teacher ratio in the ROI is 19.6. The Clark County school district has 259 schools to serve 231,655 students. The Nye County school district has 16 schools to serve its 5,290 students.

The ROI is served by 13 hospitals with a capacity of over 2,400 beds. Most of these hospitals are located in Clark County in the Las Vegas area (AHA 1995). There are over 1,400 doctors in the ROI. Almost all are located in Clark County.

4.3.9 Radiation and Hazardous Chemical Environment

4.3.9.1 Radiation Exposure and Risk

An individual's radiation exposure in the vicinity of NTS amounts to approximately 379 mrem/yr as shown in Table 4.3.9.1–1 and is comprised of natural background radiation from cosmic, terrestrial, and internal body sources; radiation from medical diagnostic and therapeutic practices; weapons test fallout; consumer and industrial products; and nuclear facilities. All radiation doses mentioned in this EIS are effective dose equivalents. Effective dose equivalents include the dose from internal deposition of radionuclides and the dose attributable to sources external to the body.

Table 4.3.9.1–1. Sources of Radiation Exposure to Individuals in the NTS Vicinity Unrelated to NTS Operations

Source	Radiation Dose (mrem/yr)
Natural Background Radiation	
Total external (cosmic and terrestrial)	74
Internal terrestrial and global cosmogenic	40[a]
Radon in homes (inhaled)	200[a]
Other Background Radiation[a]	
Diagnostic x-rays and nuclear medicine	53
Weapons test fallout	less than 1
Air travel	1
Consumer and industrial products	10
Total	**379**

[a] An average for the United States.
Source: Derived from data in NCRP 1987.

Annual background radiation doses to individuals are expected to remain constant over time. The total dose to the population, in terms of person-rem, changes as the population size changes. Background radiation doses are unrelated to NTS operations.

Releases of radionuclides to the environment from NTS operations provide another source of radiation exposure to individuals in the vicinity of NTS. Types and quantities of radionuclides released from NTS operations in 2000 are listed in *Nevada Test Site Annual Site Environmental Report for Calendar Year 2000* (NTS 2001). The doses to the public resulting from these releases are presented in Table 4.3.9.1–2. The radionuclide emissions contributing the majority of the dose to the offsite MEI were tritium, isotopes of plutonium, and americium-241 (NTS 2001). These doses fall within the radiological limits given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and are much lower than those from background radiation.

Table 4.3.9.1–2. Radiation Doses to the Public from Normal NTS Operations in 2000 (Total Effective Dose Equivalent)

Members of the Public	Atmospheric Releases		Liquid Releases		Total	
	Standard[a]	Actual	Standard[a]	Actual	Standard[a]	Actual
Offsite MEI (mrem)	10	0.17	4	0	100	0.17
Population within 80 km (person-rem)	None	0.44	None	0	None	0.44

[a] The standards for individuals are given in DOE Order 5400.5. As discussed in that order, the 10-mrem/yr limit from airborne emissions is required by the *Clean Air Act* (40 CFR 61) and the 4-mrem/yr limit is required by the *Safe Drinking Water Act* (40 CFR 141). For this EIS, the 4-mrem/yr value is conservatively assumed to be the limit for the sum of doses from all liquid pathways. The total dose of 100 mrem/yr is the limit from all pathways combined. If the potential collective dose to the offsite population exceeds the 100 person-rem value, the contractor operating the facility would be required to notify DOE.

Source: NTS 2001.

Using a risk estimator of one latent cancer death per 2,000 person-rem to the public (see Appendix B), the fatal cancer risk to the offsite MEI due to radiological releases from NTS operations is estimated to be 8.5×10^{-8}, or 8.5 cancer deaths in a population of 100 million. The estimated probability of this maximally exposed person dying of cancer at some point in the future from radiation exposure associated with 1 year of NTS operations is less than one in 1 million (it takes several to many years from the time of radiation exposure for a cancer to potentially manifest itself).

According to the same risk estimator, 2.2×10^{-4} excess fatal cancers are projected in the population living within 80 km (50 mi) of NTS from normal NTS operations. To place this number in perspective, it may be compared with the number of fatal cancers expected in the same population from all causes. The mortality rate associated with cancer for the entire U.S. population is 0.2 percent per year. Based on this mortality rate, the number of fatal cancers expected during 1999 from all causes in the population of 20,294 living within 80 km (50 mi) of NTS was 41. This expected number of fatal cancers is much higher than 2.2×10^{-4} fatal cancers estimated from NTS operations in 2000.

External radiation doses have been measured in areas of NTS that may contain radiological sources for comparison with offsite natural background radiation levels. Measurements taken in 2000 showed a median annual dose on NTS of 132 mrem (NTS 2001), or approximately 132 mrem.

NTS workers receive the same dose as the general public from background radiation, but they also may receive an additional dose from working in facilities with nuclear materials. The average dose to the individual worker and the cumulative dose to all workers at NTS from operations in 2001 are presented in Table 4.3.9.1–3. These doses fall within the radiological regulatory limits of 10 CFR 835. According to a risk estimator of one latent fatal cancer per 2,500 person-rem among workers (see Appendix B), the number of projected fatal cancers among NTS workers from normal operations in 2001 is 5.2×10^{-4}. The risk estimator for workers is lower than the estimator for the public because of the absence from the workforce of the more radiosensitive infant and child age groups.

Table 4.3.9.1–3. Radiation Doses to Workers from Normal NTS Operations in 2001 (Total Effective Dose Equivalent)

Occupational Personnel	Standard	Actual
Average radiation worker dose (mrem)	5,000[a]	41
Collective radiation worker dose[b] (person-rem)	None	1.3

[a] DOE's goal is to maintain radiological exposure as low as is reasonably achievable. Therefore, DOE has recommended an administrative control level of 500 mrem/yr (DOE 1999e); the site must make reasonable attempts to maintain individual worker doses below this level.
[b] There were 32 workers with measurable doses in 2001.
Source: DOE 2001f.

4.3.9.2 Chemical Environment

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway).

Workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. NTS workers are also protected by adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals.

Appropriate monitoring, which reflects the frequency and amounts of chemicals used in the operation processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm.

Adverse health impacts to the public are minimized through administrative and design controls to decrease hazardous chemical releases to the environment and achieve compliance with permit requirements. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts to the public may occur during normal operations at NTS via inhalation of air containing hazardous chemicals released to the atmosphere by NTS operations. Risks to the public health from ingestion of contaminated drinking water or direct exposure are also potential pathways.

Routine nonradiological air monitoring at NTS in 2000 was limited to the HSC and asbestos sampling in conjunction with asbestos removal and renovation projects. Onsite nonradiological monitoring of the HSC was conducted in 2000 for four series of tests at the HSC. This monitoring indicated no exceedances of air permit requirements (NTS 2001).

4.3.10 Traffic and Transportation

4.3.10.1 Regional Transportation Infrastructure

NTS is approximately 105 km (65 mi) northwest of Las Vegas, Nevada (Figure 4.3.10.1–1). The route to NTS from all locations of interest to this EIS goes through Las Vegas. I-15 passes through Las Vegas in a southwest to northeast direction. A beltway, I-215, is being constructed to encircle all but the east side of Las Vegas.

The mercury interchange on U.S. 95 provides the principal access to NTS. All MPF-related shipments would arrive in the region from the east on I-40 and route around Hoover Dam and the City of Las Vegas. Completion of a new bridge (planned for 2006) for U.S. 93 across the Colorado River, just south of Hoover Dam, and the new I-215 around Las Vegas could simplify the routing to and from NTS.

4.3.10.2 Local Traffic Conditions

Ninety-five percent of all commuters and shipments to NTS arrive from the Las Vegas area on U.S. 95, a four-lane highway from Las Vegas to the Mercury interchange. Traffic is light and free flowing. Commuters, however, can experience gridlock conditions within the beltway, especially at the interchanges of U.S. 93, U.S. 95, I-15, I-515, and I-215. Table 4.3.10.2–1 provides traffic information for U.S. 95 near NTS. Traffic conditions within Las Vegas are not provided since the NTS contribution to the heavy traffic congestion in Las Vegas is minimal.

Table 4.3.10.2–1. Traffic Conditions on the Access Road to NTS

Access Road	Average Annual Daily Traffic[a]	Peak Hourly Traffic[b]	Volume to Capacity Ratio[b]	Level of Service[b,c]
U.S. 95 near the Mercury interchange	3110	199	0.14	A

[a] NDOT 2001.
[b] Lawson 2002.
[c] Levels of Service:

A. Free flow of the traffic stream; users are unaffected by the presence of others.
B. Stable flow in which the freedom to select speed is unaffected, but the freedom to maneuver is slightly diminished.
C. Stable flow that marks the beginning of the range of flow in which the operation of individual users is significantly affected by interactions with the traffic stream.
D. High-density, stable flow in which speed and freedom to maneuver are severely restricted; small increases in traffic will generally cause operational problems.
E. Operating conditions at or near capacity level causing low but uniform speeds and extremely difficult maneuvering that is accomplished by forcing another vehicle to give way; small increases in flow or minor perturbations will cause breakdowns.
F. Defines forced or breakdown flow that occurs wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. This situation causes the formation of queues characterized by stop-and-go waves and extreme instability.

Figure 4.3.10.1–1. Highways in the Region of Nevada Test Site

4.3.11 Waste Management

This section describes the DOE waste generation baseline that will be used to gauge the relative impact of MPF construction and operations on the overall waste generation at NTS and on DOE's capability to manage such waste. NTS manages the following types of waste: TRU waste, including mixed TRU waste; LLW; mixed LLW; hazardous waste; and sanitary waste. Table 4.3.11–1 provides the routine waste generation rates at NTS. Table 4.3.11–2 summarizes the waste management capabilities at NTS.

Table 4.3.11–1. Annual Routine Waste Generation from NTS Operations (m^3)

Waste Type	1996	1997	1998	1999	2000	2001
Transuranic	0	0	0	0	0	0
Low-level	0	0	0	7.1	0.46	0
Mixed	0	0	0	0	0	0
Hazardous[a]	46	11	50.2	14	24.5	4.86
Sanitary[b]	4,550	2,280	6,460	7,460	5,080	4,550

[a] Includes state-regulated waste. Hazardous waste reported in metric tons.
[b] From DOE 2002o (1996 data) and DOE's Central Internet Database (available at http://cid.em.doe.gov/). Sanitary waste reported in metric tons.
Source: DOE 2002o.

4.3.11.1 Low-Level Radioactive Waste

LLW is disposed in engineered pits and trenches and in subsidence craters at two Radioactive Waste Management Sites (RWMSs) in Area 3 and Area 5 on NTS. The RWMS in Area 5 is a 37-ha (92-ac) facility consisting of trenches and pits for burying LLW and aboveground storage for TRU waste awaiting transfer to the WIPP. The Area 5 RWMS includes Greater Confinement Disposal Units, which consist of 3 m (10 ft) in diameter partially cased shafts that are 36 m (120 ft) deep. These units were used for disposing of waste not suited for shallow land burial because of high exposure and potential for migration into biopathways. DOE is considering using different disposal configurations (other than boreholes) for Greater Confinement Disposal. In the Area 3 RWMS, DOE uses surface subsidence craters (that were formed by underground nuclear tests) for disposal of LLW in bulk form (such as debris collected from atmospheric nuclear test locations).

NTS is currently accepting LLW from offsite-approved DOE and Department of Defense generators. An approved generator must undergo an extensive approval process, which is detailed in *Nevada Test Site Waste Acceptance Criteria* (DOE 2002d). The process is designed to verify that the generator site has a program in place to ensure that waste shipped to the NTS meets acceptance criteria. NTS typically receives less than 28,300 m^3 (999,414 ft^3) of LLW per year for disposal. During FY2001, the RWMSs in Areas 3 and 5 received more than 900 shipments of LLW for a total of 34,800 m^3 (122,896 ft^3). Nearly all of this LLW came from 16 offsite generators, with about 1 m^3 (35.3 ft^3) coming from onsite generators (DOE 2002b).

Table 4.3.11–2. Waste Management Facilities at NTS

Facility/ Description	Capacity	Status	Applicable waste types				
			LLW	Mixed LLW	TRU waste	Hazardous waste	Nonhazardous waste
Treatment Facility							
Explosive Ordnance Disposal Unit (kg/hr)	45.4	Online				X	
Storage Facility (m^3)							
TRU waste storage pad	1,150	Online		X	X		
Hazardous waste storage unit	61.6	Online				X	
Disposal Facility (m^3)							
Areas 3 and 5 RWMS[a]	1,000,000	Online	X				
Area 5 Pit 3 MWDU	70,800[b]	Online		X			
Area 6 hydrocarbon disposal site	92,000	Online					X
Area 9 U-10c solid waste disposal site	660,000	Online					X
Area 23 solid waste disposal site	210,000	Online					X

[a] The Area 3 and Area 5 RWMSs are capable of disposing 3.8 million m^3 (134.2 million ft^3) of LLW, if DOE were to use all available disposal area. The capacity of 1 million m^3 (35.3 million ft^3) includes LLW already disposed plus that projected through 2011.
[b] Upon receipt of the RCRA permit, this capacity may be limited to 20,000 m^3 (706,300 ft^3). The NTS capacity could accommodate 71 percent of DOE-complex mixed waste estimated to be 99,000 m^3 (3.4 million ft^3).
Source: DOE 2002k, 2002i.

As of July 2002, a total of 654,000 m^3 (23,096,010 ft^3) of LLW and 8,500 m^3 (300,177 ft^3) of mixed LLW has been disposed at the NTS. Disposal volumes are anticipated to increase dramatically in the next few years as a result of accelerated clean-up initiatives across the DOE complex (DOE 2002l).

4.3.11.2 Mixed Low-Level Waste

DOE's ROD for the Waste Management PEIS (65 FR 10061, February 25, 2000) identified NTS as one of two national mixed LLW disposal sites for the DOE complex. One interim status disposal unit at Area 5 is currently being used to dispose of mixed LLW generated from NNSA/Nevada (NV) activities. NTS is not currently permitted to receive mixed LLW from offsite (excluding NNSA/NV) locations. On December 22, 2000, DOE submitted a RCRA permit application requesting that NTS be allowed to dispose of mixed LLW generated both onsite and offsite in the Pit 3 Mixed Waste Disposal Unit (MWDU) in Area 5. The proposed facility would have a disposal capacity of 20,000 m^3 (706,300 ft^3). The permit application for the MWDU is under review by the State of Nevada (DOE 2002c). DOE expects to receive the RCRA permit and start mixed LLW disposal operations at NTS in FY 2003 (DOE 2002l).

Mixed waste is stored on a pad in the Area 5 RWMS awaiting treatment and/or disposal. Most of mixed LLW generated at NTS is shipped offsite for treatment. In recent years, NTS has shipped mixed LLW to Waste Control Specialists and to a treatment facility at the Hanford Site. NTS' projected mixed LLW generation from 2000-2070 is negligible (<1 m^3 [<35.3 ft^3]) and is derived primarily from deactivation and decommissioning activities (DOE 2001c).

4.3.11.3 Transuranic and Alpha Waste

Most of the TRU waste currently stored at NTS was generated at the Lawrence Livermore National Laboratory. This legacy waste was shipped to NTS for temporary storage between 1974 and 1990. A small quantity of TRU waste was generated at NTS by environmental restoration activities on NTS and the Tonopah Test Range. These TRU wastes are stored at the TRU Waste Storage Building in the Area 5 RWMS pending shipment to WIPP. The Waste Examination Facility located just outside the Area 5 RWMS will be used to characterize and certify the NTS inventory of TRU waste in accordance with the WIPP waste acceptance criteria. DOE anticipates shipments to WIPP beginning in September 2003, with an initial shipping campaign of 215 m^3 (7,593 ft^3). The current volume projections and WIPP shipment schedule indicate that the TRU waste storage volume is sufficient to meet NTS's needs.

DOE has proposed to accelerate the disposition of legacy TRU waste stored at NTS. Nuclear safety authorization basis documents will be streamlined and mobile vendors will be used to characterize and certify TRU waste for disposal at WIPP. Beginning in 2004, DOE will investigate technologies for those NTS TRU wastes with no current path forward for disposition, including oversized, classified, and spherical TRU wastes. Under this strategic initiative, DOE would complete the disposition of all non-classified TRU waste stored at NTS by July 2007, two years ahead of existing Site Treatment Plan deadlines. If the proposed treatment for the NTS legacy TRU waste is unsuccessful, DOE would pursue an alternate path of transferring the waste to a western hub, such as the Hanford Site, under the Western Small Quantity Site Acceleration Program described in the *Transuranic Waste Performance Management Plan* (DOE 2002m). The western hub will have the capacity to process all of the NTS waste, if necessary (DOE 2002l).

4.3.11.4 Hazardous Waste

NTS stores hazardous waste onsite prior to shipping it to a permitted commercial facility for treatment/disposal. NTS received its final RCRA permit for storage in 1995 and renewed that permit in 2000. The permit limited storage to 61,600 L (16,300 gal) or 61.6 m^3 (2,175 ft^3) at one time. This storage capacity is adequate for projected waste volumes.

NTS is also permitted to treat certain explosive hazardous wastes. The projected volume of explosive waste to be treated is well under the limit set by the RCRA permit.

NTS also manages waste containing PCBs regulated under TSCA. Regulated PCB waste is not generated during operations, but could be generated during remediation and decommissioning activities. Currently, PCB-contaminated mixed and LLW are stored on the TRU Waste Storage Pad in a designated area outside of the TRU Pad Cover Building. PCB-contaminated hazardous waste can be stored in the Hazardous Waste Storage Unit. Treatment and disposal options for the PCB wastes are available; therefore, the wastes are shipped offsite when sufficient quantities have accumulated. During FY2001, DOE made one shipment of PCB-contaminated LLW (0.226 m^3 [8 ft^3]) from NTS to the TSCA incinerator in Oak Ridge, Tennessee.

4.3.11.5 Sanitary Waste

NTS has three landfills permitted for the disposal of non-hazardous waste in accordance with the classifications set forth in Nevada Annotated Code (NAC) 444.570-7499. The Hydrocarbon Disposal Site in Area 6 and the Area 9 U10c Disposal Site are permitted as Class III (industrial solid waste) landfills. Hydrocarbon-contaminated soils and sludge are disposed in the hydrocarbon landfill, and inert debris (such as construction and demolition debris) is disposed in the Area 9 landfill. The third landfill is a Class II (municipal solid waste) landfill in Area 23 that receives sanitary solid waste. Currently, only NTS and offsite Nevada locations under the control of NNSA/NV dispose of waste in these NTS landfills. However, DOE intends to use the Area 9 and Area 23 landfills for the disposal of construction and demolition debris and sanitary and industrial solid waste from the proposed Yucca Mountain repository, if a nonhazardous waste landfill is not sited at the repository.

Construction of a new Class I or II landfill at NTS with a capacity of approximately 420,000 m^3 (1,483,230 ft^3) was included under the Expanded Use Alternative of the 1996 *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE 1996b). In a recent supplement analysis to that EIS (DOE 2002i), DOE concluded that the projected waste volumes through 2011 would consume less than 20 percent of the available sanitary waste disposal capacity at NTS.

4.3.11.6 Wastewater

Wastewater at NTS is disposed either by a septic system or a lagoon system. Sewage lagoon systems other than Area 23 Mercury and Area 25 Effluent Treatment System will be replaced by septic systems. Sludge removed from the systems is disposed in the Area 23 sanitary landfill or the Hydrocarbon Disposal Site, depending on hydrocarbon content. At areas not serviced by a permanent wastewater system, portable sanitary units are provided. Review of the historic flow records and design capacities by DOE did not indicate impacts to wastewater capacity beyond permit and design limitations (DOE 2002i).

4.3.11.7 Pollution Prevention

The total waste (routine waste as well as environmental restoration and D&D waste) generated by NTS was 13,400 m^3 (473,221 ft^3) in FY2001, accounting for 2 percent of DOE's overall waste generation. Implementing pollution prevention projects reduced the total amount of waste generated at NTS in 2001 by approximately 1,390 m^3 (49,088 ft^3). Examples of NTS pollution prevention projects completed in 2001 include the reduction of mixed LLW by 80 m^3 (2,825 ft^3) by segregating lead contaminated metal and ash from mixed LLW. The segregated lead materials were managed as mixed LLW and the remainder was found to be free of lead contamination and disposed of at NTS as LLW. NTS also reduced their hazardous waste by 1 metric ton (1.1 tons) and sanitary waste by 4 metric tons (4.4 tons) by identifying a reuse for chemicals, equipment, instrumentation, and supplies removed during the decommissioning of the Analytical Radiological Laboratory (DOE 2002g).

4.3.11.8 Waste Management PEIS Records of Decision

A discussion of DOE's hazardous waste, LLW, mixed LLW, and TRU waste decisions based on the Waste Management PEIS is provided in Section 4.2.11.8. The Waste Management PEIS RODs affecting NTS are shown in Table 4.3.11.8–1.

Table 4.3.11.8–1. Waste Management PEIS Records of Decision Affecting NTS

Waste Type	Preferred Action
TRU waste	DOE has decided to store and prepare TRU waste onsite prior to disposal at WIPP.[a]
LLW	DOE has decided to continue to treat and dispose of NTS LLW on site. In addition, NTS is available to all DOE sites for LLW disposal.[b]
Mixed LLW	NTS will continue to dispose of its own mixed LLW on site and will receive and dispose of mixed LLW generated and shipped by other sites, consistent with permit conditions and other applicable requirements.[b]
Hazardous waste	DOE has decided to continue to use commercial facilities for treatment of NTS nonwastewater hazardous waste.[c]

[a] From the ROD for TRU waste (63 FR 3629) and the ROD for the WIPP Disposal Phase SEIS (63 FR 3624).
[b] From the ROD for LLW and mixed LLW (65 FR 10061).
[c] From the ROD for hazardous waste (63 FR 41810).